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Popular Mechanics

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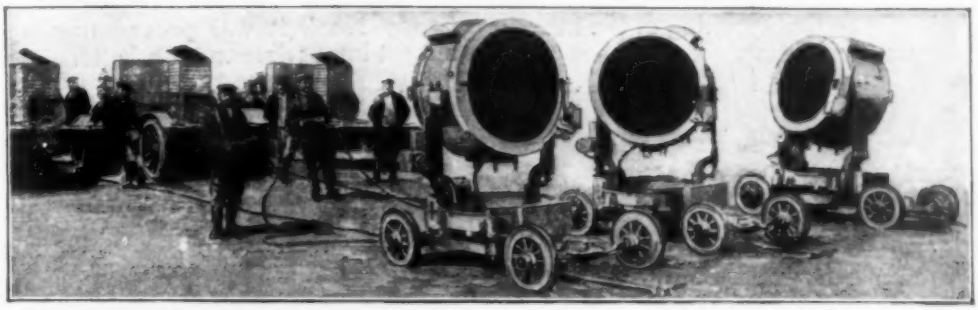


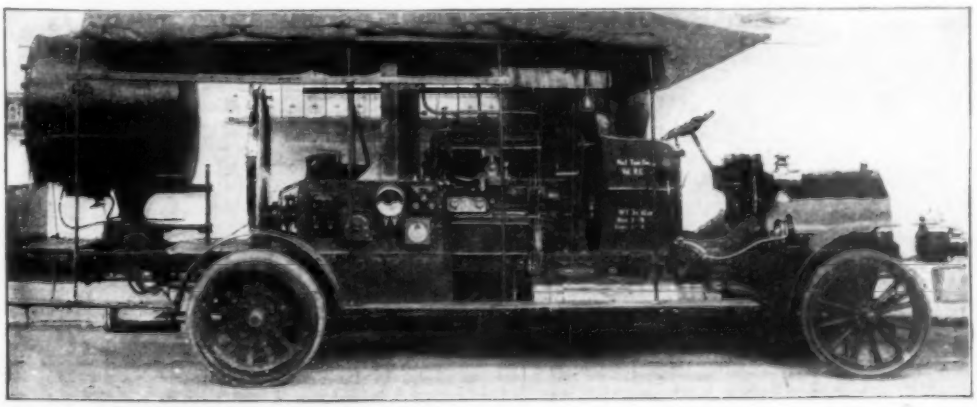
Battery of French Searchlights and Motor Trucks That Carry Them

FRENCH AND ENGLISH MOTOR SEARCHLIGHTS

Two types of powerful automobile searchlights, one used by the English army and the other by the French, are shown in these illustrations.

The French searchlights ride upon small 4-wheeled trucks of their own when in operation, but are carried on the motor-truck containing the power plant when being transported from place to place. The entire electrical outfit is behind the driver's seat, and about three-fourths of the body area to the rear of the attendant's seat is free to receive the searchlight and its truck.

The English motor searchlight is



English Motor Searchlight

unlike the French in that the searchlight proper is mounted on the motor truck itself, with a base that allows it to be swung in any direction.

Both the English and French types are expected to be of great value in times of war, as they can be quickly rushed to any point, providing the ground or roads are passable, to locate various topographical features, and spy out attempted secret movements of the enemy. Probably one of the greatest uses to which they will be put will be the searching of the heavens for aerial fighters.

UNITED STATES ARMY TESTS PROVE EFFICIENCY OF THE DIRIGIBLE

By L. W. Thavis

The army officials in charge of the signal corps of the United States army do not agree with the French war minister, who believes that the aeroplane will be more serviceable in the future than the dirigible balloon.

As a result of the recent experiments conducted at the proving grounds at Sandy Hook it was proved that it is almost impossible to hit a balloon even when it is less than 500 ft. above the ground and within easy range of the shrapnel guns. During the experiments the best gunners in the United States army were stationed at the guns and attempted to hit the balloon swaying within incredibly easy range. Yet out of a total of 90 shots fired only three hit the balloon and only one shot caused the balloon to sink to the ground. Even the shot which finally caused the great inflated bag to come down was not sufficiently effective to bring it to earth with the celerity that would prevent a dirigible balloon from getting away in time of war. The

Courtesy Gas Power

Gasoline-Driven Stacker in Operation

STACKING HAY BY GASOLINE POWER

This hay-stacking machine is operated by a gasoline engine, the hoist being mounted on one end of the engine truck. The hoist is under perfect control of the man operating the stacker, as the illustration shows, which means that one man less is required for the work. The gasoline engine, which is rated at 3 hp., furnishes ample power for operating the hoist. The hoist has a device for throwing the drum in and out of gear, and this is operated by the stacker-operator by means of lines.

other two shots were practically without any effect.

It was demonstrated to the satisfaction of the army officers in the ordnance department that it is necessary to devise a special gun and a special shell in order to destroy an airship. It is also acknowledged that an entirely different mode of marksmanship must be devised before an effective warfare can be waged against the balloon craft.

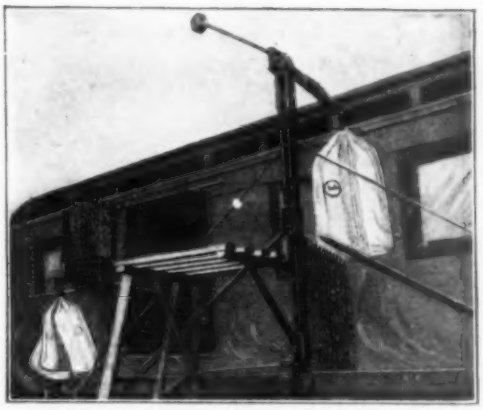
On the other hand, the officers in charge of the aeronautic division are jubilant because they think the tests have proved without question the great value of the dirigible in warfare. They point out that this type of airship can hover above a spot for hours and precipitate a regular torrent of deadly missiles upon the enemy without being in much danger from the firing of the gunners underneath.

It is believed by the army officers in Washington that the dirigible balloon, with its ability to carry great tonnage and to remain in the air for many hours, will in the end be infinitely more valuable in war than the aeroplane. It is considered practically impossible to hit a balloon in consequence of the Sandy Hook tests.

CHAIN-NET MAIL CATCHER

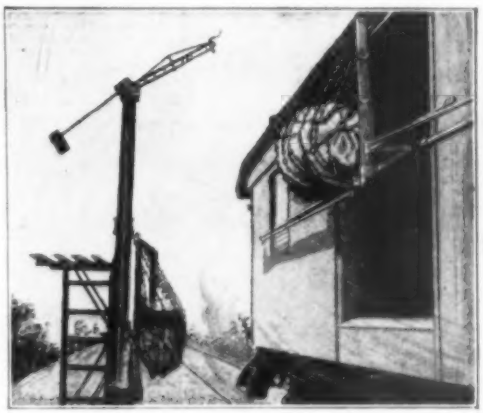
A new mail-catching device, which not only delivers mail bags to fast-moving trains but receives them as well, handling two or more bags as easily as one, is being installed on the Freeport division of the Illinois Central railroad.

The unique feature of the catching device is the baggy steel-chain nets, which operate in the following manner: Attached to the outside of the mail car is a square steel frame, to which the chain net is attached. This frame is made to swing on hinges attached to sliding bars so as to permit the device to be quickly shifted from one side of the car door to the other, according to the direction in which the car is moving. Attached to the lower outside corner of the frame is



Roadside and Car Device in Operative Position

one end of an iron rod, with the other end traveling on a bar attached to the car side containing a set of spiral springs so adjusted as to bear by compression the shock resulting from the frame and net catching the mail bags. On the same outside corner of the frame, below where the rod is attached, is a hook or finger for the attachment of the bags to be delivered.



The Mail Exchanged

The roadside device, which acts in conjunction with the one attached to the side of the car, is similar in all respects, except that the bags it delivers to the train are hung above the receiving net, while with the car device the bags hang below the net.

The illustrations show clearly how the device operates. One of them shows the car approaching the roadside catcher, with two bags in posi-

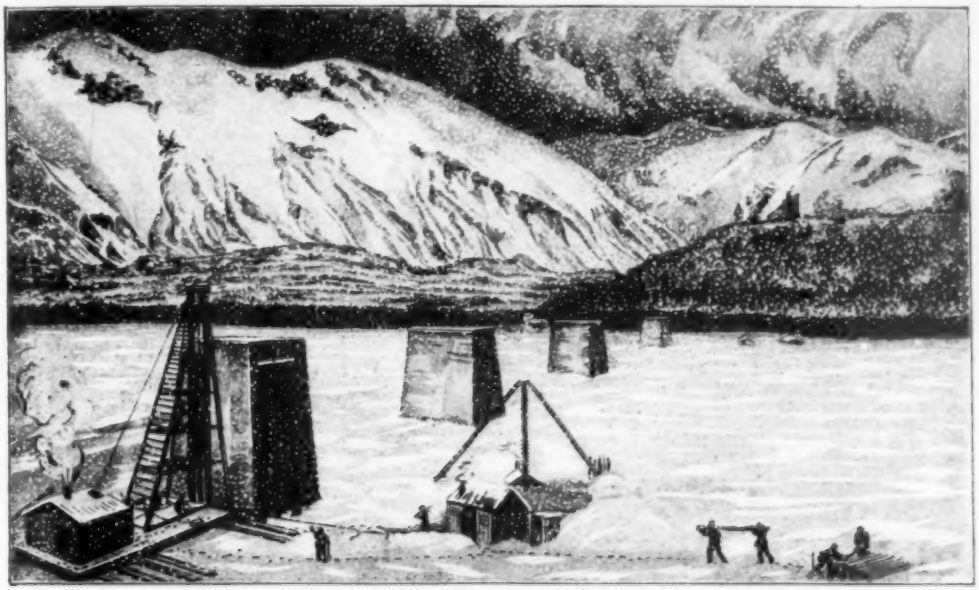
Heads of Past Presidents as Club Decoration

tion to be delivered to the station, and one bag in position to be delivered to the train. The devices meet as the train rushes past, and the exchange is made, the force of impact being absorbed by the slack of the chain net and by spiral springs. The reflex action of the springs throws the frames and chain nets back as shown in the second illustration, with the mail bags surrounded by the nets.

IDEA FOR CLUB DECORATION

The gallery in the billiard-room of the new British Empire club in London has a beautiful decoration in which classic mouldings in dazzling white are the main feature in the scheme. This same idea for the reception, or any other general room, of a club, with the heads of past presidents in place of the classic heads, would provide some-

thing very new and unique in club decoration. How such a treatment would appear is shown in the accompanying drawing.



Building Great Railroad Bridge in Alaska

PNEUMATIC CAISSON PIERS TO WITHSTAND GLACIERS

The difficulties under which the engineers building the Copper River & Northwestern railway in Alaska are laboring have been mentioned before in this magazine, especially the problem of building bridges across a river discharging icebergs and huge masses of ice broken off from the 3-mile faces of the glaciers in the vicinity.

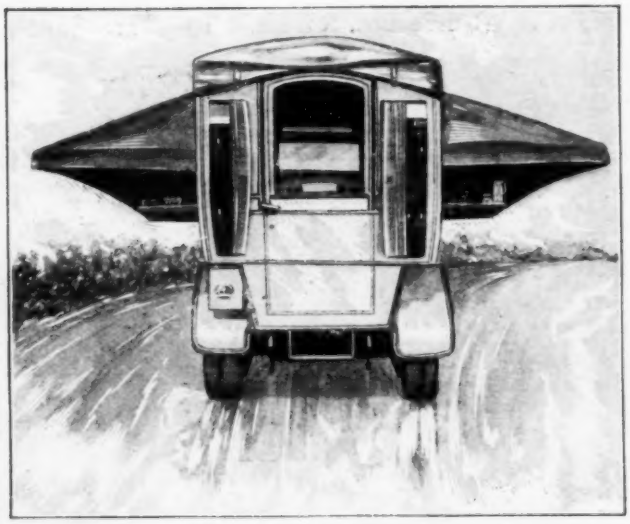
These millions of tons of ice, moving at a high velocity during flood seasons, together with the short season and severity of winter, the depth of the water, and the character of the bottom, required the utmost care in the location and design of bridge piers of exceptional stability and strength.

The piers selected are of the pneumatic caisson type, and the accompanying illustration shows the plant installed on the ice for building those of the Miles glacier bridge. This bridge is about one-fourth of a mile above the Childs glacier, and three miles below the Miles glacier. The piers are located 300 and 450 ft. apart on bars which are out of the track of the heaviest flow of ice. They are built on pneumatic caisson foundations carried down to a maximum depth of 44 ft. below low water. They have sharp cutwaters, and are heavily armored with old rails close together in vertical planes, set flush with the battered surface of the concrete, and extending from low water to above high water level. The piers, 55 ft. high, will carry the superstructure 30 ft. clear of the highest water, and are solid 6-sided masses of concrete about 64 ft. long and 21 ft. wide at the bottom, and about 13 by 45 ft. at the top.

This railroad has already been constructed 100 miles inland from the deep-water port of Cordova, on Prince William sound, and the present extension of about 100 miles more will take it in the great Alaskan copper region.

¶Several churches in different parts of Massachusetts give weekly moving-picture entertainments as a means of building up the Sunday School attendance.

THE KAISER'S AUTO FIELD KITCHEN



German Auto Field Kitchen

This rather novel-appearing automobile is the field kitchen which supplies the German Kaiser with food at the military maneuvers. In the forward section of the vehicle is an alcohol-heated stove having five openings in the top and fitted with a boiler. Underneath are two ice boxes, to one side are lockers for edibles, and on the other side are cupboards for the imperial plate. The openings shown on each side of the door in the illustration contain tables. The canopies on each side fold against the car body when not in use.

STEEL SHED 140 BY 75 FEET MOVED ON SCOWS

The reconstruction of Pier 42, North River, New York, used by the French trans-Atlantic line, necessitated the removal of a 200-ton steel shed to a new foundation on the Staten Island shore, eight miles distant. The shed is 75 ft. wide by 140 ft. long, and has a height of 45 ft.

Two 40 by 175-ft. dump-scows, 13 ft. deep, were lashed together and placed alongside the pier to receive the shed. Five floating pile-driving scows were provided to move the shed from the pier to the scows. The hoisting engines of the pile-drivers operated tackle which drew the shed from the pier. The same method of sliding ways and pile-driver power was used to pull the shed from the scows to the site of its new foundation.

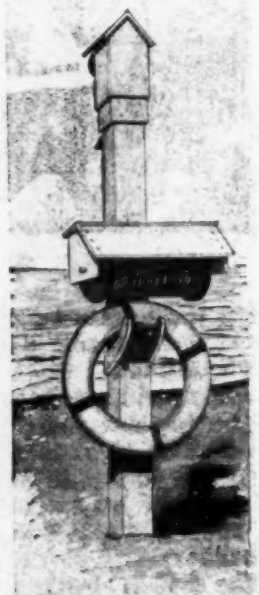
The work was executed by 20 men, and the fact that the moving was accomplished without breaking a single pane of glass in the windows, all of which were left in position, demonstrated that the system of temporary bracing which was adopted provided for all stresses.

Huge Steel Shed Transferred to Scows

WHERE A SLIP MEANS DEATH—Followers of the structural steel and iron trade, probably the most dangerous vocation in the world, working on the pinnacle of one of the new skyscrapers in lower New York.

UNIQUE LIFE-SAVING .. STATIONS ALONG CALIFORNIA BEACH

The illustration shows the unique life-saving stations that have been installed at intervals of two blocks all along the beach at Venice, Cal., which is the seaside resort for Los Angeles. Each station is equipped with a life buoy and life line, the latter being wound on a reel and protected from the elements, while the top of each pole is surmounted by an alarm gong. The ringing of this bell is the signal that some bather is in distress in the surf, and aid is rendered by the first swimmer to appear upon the scene who feels competent to carry the buoy and life line through the breakers. These stations have been erected by popular subscription and municipal assistance, and although established only a short time they have already been responsible for the saving of many lives. The sounding of the alarm gives notice to the volunteer life-saving corps that there is trouble and the lifeboats are quickly launched. These stations extend for a distance of two miles—from Santa Monica to Venice—protecting every foot of the bathing beach.

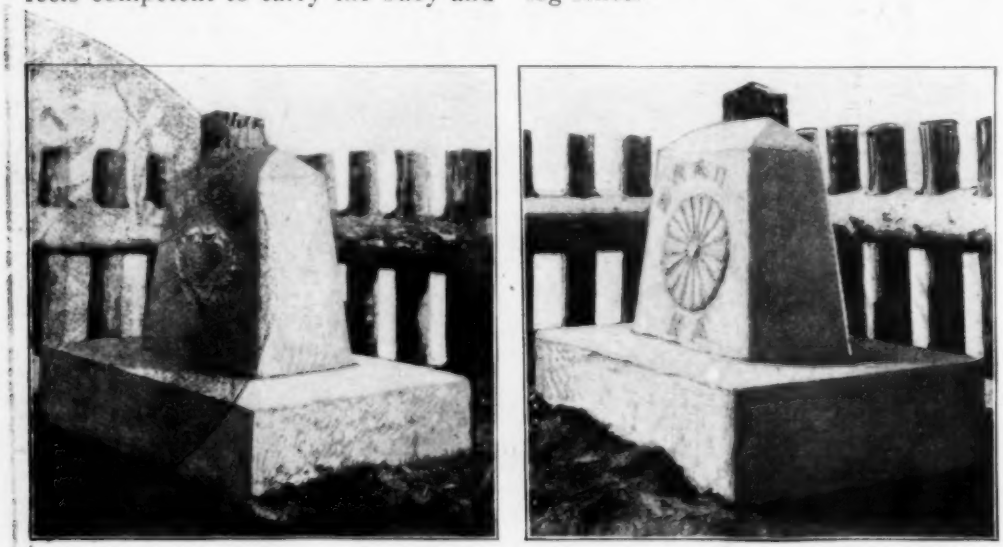


These Stations Have Saved Many Lives

MARKING THE DIVIDING LINE OF JAPANESE AND RUSSIAN POWER

The border line dividing the territory in Asia under Russian and under Japanese jurisdiction, over which the two countries fought one of the bloodiest wars in modern history, is marked at certain intervals by stone sentinels, in pairs. Both stones of a pair are of the same size and shape, but on one the inscriptions are in Japanese and in Russian on the other. The border line runs between the stones.

The stones are protected from damage at the hands of tourists by a heavy log fence.



Stone Sentinels of Jap-Russian Border

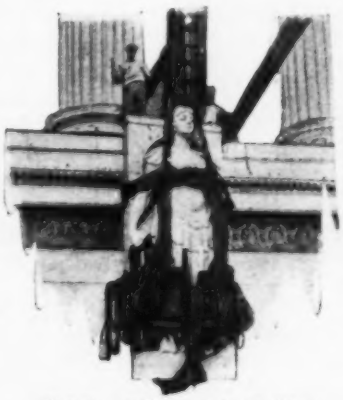
THE GREAT VICTOR EMMANUEL MONUMENT

The great memorial to Victor Emmanuel, the first king of Italy, now approaching completion in Rome, is one of the largest and most beautiful monumental undertakings carried out in modern times.

in the accompanying illustrations, are prominent in the scheme, as well as the groups of figures symbolical of Thought and Action, Sacrifice and Concord, Strength and Right, and six figures of Victory, placed on columns

The Columns of the Great Monument

Statue Representing Lombardy



Hoisting a Statue into Position

Statue Symbolic of Piedmont

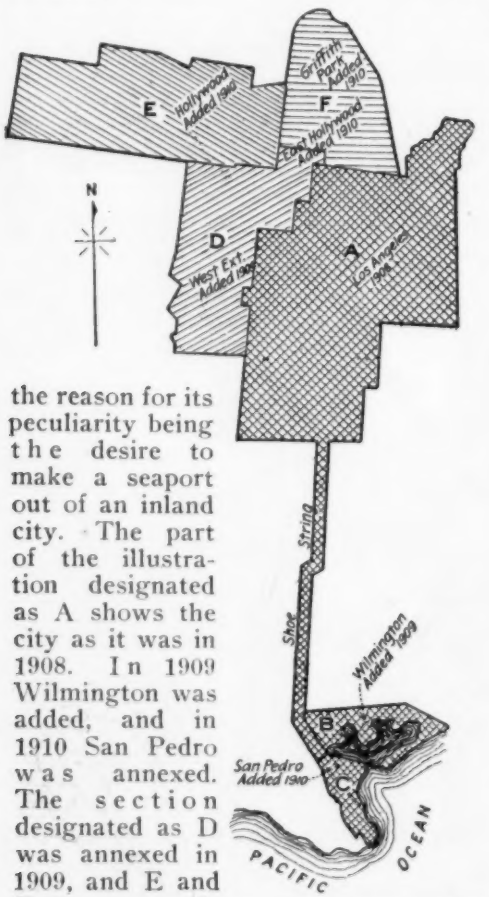
The huge equestrian statue of King Victor will be the central figure, surrounded by 14 statues representing the different personalities concerned in the welfare of Italian independence. Statues representing the different provinces of Italy, some of which are shown

The portico will have a stucco canopy composed of lime and marble, designed on much the same system as the beautiful arcades of old Roman monuments. It will be subdivided into 17 large squares, eight of which will have bas-relief figures representing the

sciences and arts. This portico is shown in the illustration, which also shows the dismantling of a small Venetian palace to clear a space before the monument. The other illustrations show statues representing the Italian provinces, one of which, that of Lazio, is being hoisted into position.

THE CURIOUS SHAPE OF LOS ANGELES

Los Angeles, Cal., claims the distinction of being one of the most curiously shaped cities in the world,



Courtesy Engineering News

the reason for its peculiarity being the desire to make a seaport out of an inland city. The part of the illustration designated as A shows the city as it was in 1908. In 1909 Wilmington was added, and in 1910 San Pedro was annexed. The section designated as D was annexed in 1909, and E and F were made parts of the city this year. The coast annexations, San Pedro and Wilmington, are connected with Los Angeles proper by the narrow strip known as the "Shoe String."

THIRD RAIL SEVERS ARTERY AND SEARS ENDS

The only case on record, where a current of electricity of 550 volts strong enough to kill many men, has been instrumental in saving life, is that of Percy Cosgrove, eighteen years old, who lives at 56 Somers Street, Brooklyn, N. Y.

He was at the Chauncey street station of the elevated railroad recently awaiting a train, when he lost his balance, and fell to the tracks. His hands grasping the third rail and his thigh resting against it formed a path for the deadly current which went through his body while he lay unconscious. The flesh was burned from the bone of his leg and the femoral artery severed. The man would have bled to death but for the fact that the current after severing the artery seared it and closed it as though it had been done with a red hot iron. Trains were stopped, the current was turned off, and the young man was hurried to the hospital.

The physicians say that the case is without a parallel. Previous to the ligature of arteries, when an amputation was made the process was to sear the wound, closing the artery and stopping the flow of blood by the use of a red hot iron. In this case the current of electricity performed the same function, having exactly the same effect.

THE POWER OF STEAM

A comprehensive idea of the power of steam is given in the following paragraph taken from the "Power" magazine:

"It is estimated that a cubic foot of water under 70 lb. pressure and heated to a temperature corresponding to steam at that pressure, contains about the same energy as 1 lb. of gunpowder. Further, that a plain cylindrical boiler of average size with steam at 100 lb. pressure and filled with water to the proper level, has sufficient energy to project the boiler to a height of 3½ miles."

Sentry Duty

The Spread of the Boy Scout Movement

By FRANCIS BUZZELL

A LITTLE while before the German invasion scare had at last succeeded in scaring itself to death, the boy scout movement, destined to spread itself around the earth, was started in England. At first, because war was in the minds of the English people, the movement was thought by some to tend too much towards the encouragement of militarism, but the little opposition even then apparent was soon evaporated by the realization of the great and everlasting good the idea was bound to develop.

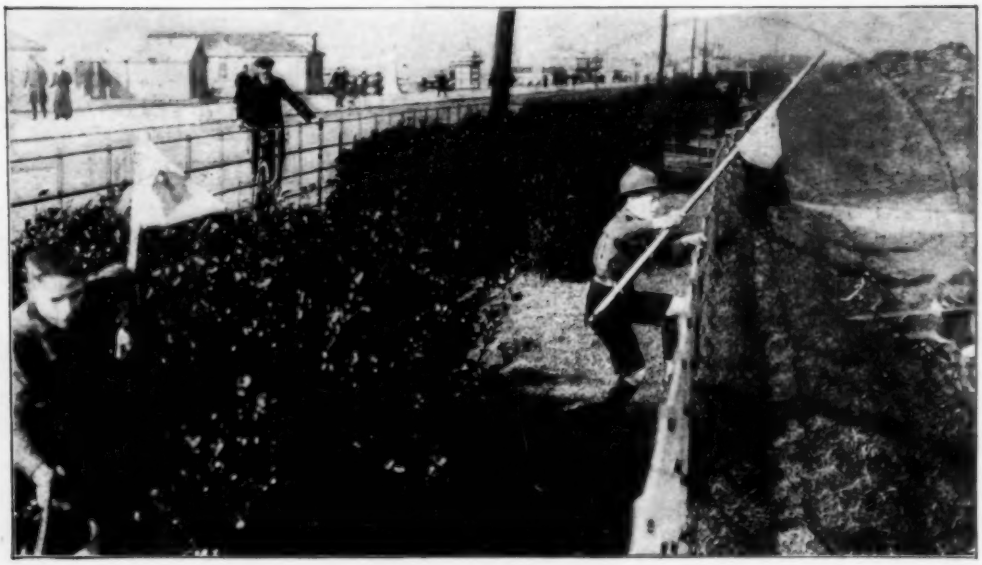
Militarism, in the true meaning of the word, there is not, but protection there is. And, truly, no protection is more potent than that provided by the proper development of boys. Militarism has its part to play, but the place it occupies is in that part of the boy's mind which demands some reason other than being good for good's sake to hold him steadily marching up the heights towards attainment. What means of appeal or suggestion underlying a movement for the development of lasting good is more praiseworthy then, than the idea that it is for the protection of the home in case of foreign invasion? What aims are higher for the boy than patriotism, discipline, courage, self-reliance, self-control, courtesy, thrift, helpfulness, and cheerfulness?

The King's Badge
Presented to
First-Class Scouts

Every boy scout has to try hard to develop all of them, and he has a new reason for trying. The doing or leaving undone of a thing because it is or is not good never appeals strongly to the average boy, but the doing or leaving undone of a thing because it makes or mars a good scout is proving an overwhelming reason.

A most excellent example of this has already been provided by the manner in which the influence against smoking is taking hold. Why tell the boy it is a sin to smoke? The chances are that his father smokes, and it is not impossible that the minister smokes. Instead, the boy scout is told that the best military scouts do not smoke, because it weakens their sight, sometimes makes them shaky and nervous, spoils their noses for smelling, which is of great importance at night, and because the glow from pipes or cigars, or even the scent of tobacco might give them away to enemies.

The Silver Wolf
Presented to
Second-Class Scouts



A Cross-Country Maneuver

Gen. Baden-Powell Presenting Scouts with Colors

For just such reasons as the above, one appealing strongly to the romantic and venturesome in the boy, and the other appealing to the desire of the parents for the boy's betterment, the movement spread until not a section or community in England is without representation. Thence it spread to the British colonies, and now bodies of men who have the welfare of the younger generation at heart have taken up the idea in the United States, and are pushing forward an organization similar to that founded in England.

Even General Sir Robert Baden-Powell, founder of the movement, and the boys' own general, had little idea of the magnitude of the popularity that would attend his efforts. Boy scouts seem to turn up at all times and at all sorts of places in England, and invariably with good re-

Boy Scouts Marching to the Rendezvous

sults. One of the accompanying illustrations depicts them actively assisting in the work of decorating the streets for King Edward's funeral. They also helped keep the streets clear, and have, on occasion, turned out to assist people through London fogs.

As the boy scout movement in America is to be patterned after that in England it is well to give a general idea of the kind of organization it is and how the boys are being developed.

The general organization, and the symbolism of the scout movement are essentially military, but the strict military discipline, and especially the routine of incessant military drill, are almost entirely lacking. General Baden-Powell, chief scout of all the boys in the British Empire, appoints scout commissioners

Gun Drill by Sea Scouts

to organize branches, inspect scout corps, and help scout masters. This work of organization is done through scout councils, composed of leading citizens of each locality, including special representatives from other local organizations, among whom are parents, school-teachers and others interested in work among boys.

The scout master is the officer in charge of a troop of two or more patrols, and must be of the age of 20 years or upwards. The patrol is the "Unit" and consists of six to eight boys under the immediate charge, while on duty, of a patrol leader, who is elected or appointed for one year.

The scout recruit is received as a tenderfoot, passes to the degree of second-class scout, and finally becomes a first-class scout. Only first-class scouts are appointed patrol leaders or scout masters.

Before a boy is received as a tenderfoot he must be, for the time being, a sailor, and must learn the principal knots. These include the square knot, the sheet bent, the clove hitch, bowline, middleman's knot, fisherman's knot, and sheep shank. Who knows but he may be called upon at any time to aid himself or another when the ability to tie the proper knot will be of the greatest assistance. Therefore, he ties and unties these knots until he can pass the examination.

While the boy is still a tenderfoot he must learn a great many things, among which are to be found the following:

If he lives in the country he must be able to track a comrade a half mile in 20 minutes. He acquires the ability to do this by practice, and to this end deer hunts are organized. One scout, as the deer, runs away in any direction he pleases. If it is not possible to track him in any other way, the deer drops a few kernels of corn or wheat occasionally for the others to follow. After giving him 20 minutes' start the hunting scouts, armed with tennis balls, or rag balls, follow until they catch up with the deer. It takes three hits to kill the deer, but if the deer gores (hits) the hunter once, he must fall out of the hunt as dead or wounded. The evening before the hunt the patrol or troop may meet in camp —which is a convenient barn, house, or tent—and the scout master may tell or read a camp yarn.

Other things the tenderfoot must be able to do before becoming a second-class scout are: to go a mile in 12 minutes at scout pace; lay and light a fire, using not more than two matches; know the points of the compass; learn and practice first aid to the injured; cook a quarter of a pound of meat and two potatoes without utensils other than his regulation "billy"; and have at least a shilling (about 25 cents in American money) in the savings bank.

Before becoming a first-class scout the boy must swim 50 yd., or, in case swimming is forbidden by the physician, must perform some other equivalent selected by the scout master. He must receive and send a message by Morse code and semaphore at a speed of at least 16 letters per minute. He must show he knows the proper means for saving life or rendering assistance in case of accident by fire, drowning, runaway, gas, or broken arm. He must bring in a tenderfoot to whom he has taught the tying of the principal knots and the scout law. He must go on foot or row a boat alone seven miles and return, and write a short report of what he saw. Finally, he must have at least four shillings (about $1.00) in the savings bank that he has earned himself.

The scout oath and the scout law are as follows:

"On my honor I promise that I will do my best to do my duty to God and my country; to help other people at all times; and to obey the scout law."

Scout Law: 1—A scout's honor is to be trusted. 2—A scout is loyal to his country, to his parents, and to his employers. 3—A scout's duty is to be useful and helpful to others, and he must try to do at least one good turn to somebody every day. 4—A scout is the friend and brother to every other worthy scout, no matter to what social

Up a Tree to Find the Enemy

Stalking the Enemy in Deep Grass

Hut-Building in Camp

Military Bridge 40 Ft. Wide Constructed by Boy Scouts

class the other belongs. 5—A scout is courteous to all. 6—A scout is a friend to animals. 7—A scout obeys the orders of his parents, his teachers, his scout master, and patrol leaders. 8—A scout is thrifty, he earns and saves money so that he may not be a burden, but may help others.

A few simple lessons are outlined for military drill in the scout manual, but the drill is merely to enable the scout master to move his troop or patrol in good order, and is not an exercise for frequent practice. "When I see a troop drill well," says General Baden-Powell, "but fail to follow a trail or cook its own food, I know the scout master is not good as such."

Scouts Decorating the King's Funeral Route with Laurel

The alert scout is taught to stand erect, feet together, hands hanging naturally at the sides, fingers straight, and eyes front. Enough stave drill is provided to supply the need of exercise when an outdoor game cannot be played. There are more than 50 different outdoor games described in the scout manual, and all call for alertness, both physical and mental. Many train the eye-sight and powers of observation, and not a few train the powers of deduction. Many of the games and most of the "camp yarns" are taken bodily from history or literature. The boys, and especially the scout masters, are encouraged to read such books as "Kim," by Rudyard Kipling, "Bob the Ranger," by Herbert Strang, "Kidnapped," by Robert Louis Stevenson, "Heroes of Pioneering," by Edgar Sanderson, "Two Little Savages," by Ernest Thompson Seton, "Memoirs of Sherlock Holmes," the "Jungle Book," and "The Wild Animal Play." From these they get the inspiration for new games, and all of them carry the boys above the harmful juvenile fiction known as the "dime novel."

The older boys among the scouts practice elementary engineering, judge

distances and heights, plan roads, chop trees, or packing boxes if trees are not available, use tools, make models of bridges, make boats and rafts, study steam and gasoline engines, telegraph and telephones, and even wireless telegraphy.

The uniform is simple and inexpensive, and not positively required. It consists of a flat brimmed hat, flannel shirt, sweater if needed, knee trousers, stockings and shoes. All are of khaki color, an aid to concealment from the enemy. The shoulder knot alone is compulsory, and it consists of a simple knot of ribbon or tape of the patrol colors.

The badges worn by second and first-class scouts are obtained at cost from the general committee or council, and are awarded by the local committee upon recommendation of the scout master. The so-called secret signs consist of a salute and word of greeting.

The health is cared for by the scout in order that he may better serve his country and accomplish any scouting duty. He practices the finding of good water, and boils the drinking water if there is suspicion of taint. Tenting out in good weather is favored. It need not be for any great length of time, and may be pitched for a few days in a vacant lot in the neighborhood.

Suspicious Motorcyclist Stopped by Scouts

In the above can be clearly seen the reasons why the boy scout movement has become so popular. There is enough of militarism in it to give the boy an incentive for making his body and mind healthy and strong, and it teaches him to be helpful to himself and others. He feels that he is a man; that he is doing something for his

country. The boys of the past generation in the United States played at fighting Indians, and holding up mail coaches on the plains. They still do, although the days of the Indian and mail coaches are of the past, but the boy scout game is of a much higher order, far more fascinating for the participants, and, in place of a more or less demoralizing make-believe, is infinitely instructive.

Not content with land operations in England, the scout movement has spread to the sea, and "sea scouts" have been organized.

The movement in the United States, which, of course, has nothing whatever to do with the British organization, is rapidly gaining ground. Central bodies in such cities as New York, Chicago, and San Francisco have organized to arrange details. The plan of organization and participation will be the same as that in England, but the scout unit will be ten boys instead of only six or eight. Local committees will be formed wherever desired and any ten boys may get together and form a patrol under the supervision of their local committee.

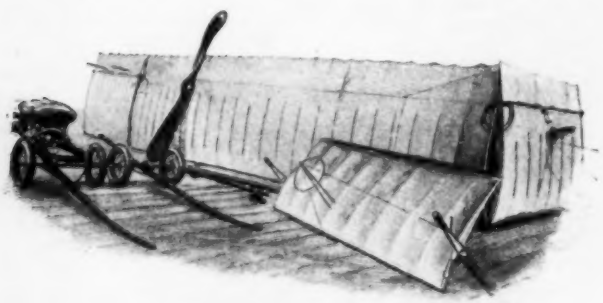
MEASURING DEPTH OF WATER BY SOUND

An electrical device whereby a sound wave is sent to the sea bottom, in relatively shallow water, and upon being deflected back to the vessel is received by another part of the same apparatus, has been designed in Norway for measuring the depth of the sea. An automatic record is made of the time elapsed between the departure and the return, and, as the velocity of sound in water is known, the depth is at once ascertained.

The apparatus makes a continuous record, and is so constructed as to give an alarm when the water shallows to a certain depth. Several tests of the apparatus are said to prove the absolute accuracy of the device.

THE PACKING OF AN AEROPLANE

The famous Farman biplane with which Paulhan made the flight from London to Manchester, winning a prize of $50,000, is shown in this illustration dismantled and partially packed for shipment.



Packing Paulhan's Aeroplane

BILLIONS INVESTED IN ELECTRICITY

According to a bulletin issued by the Department of Commerce and Labor there were, in 1907, upward of 30,000 individuals, companies, corporations, and municipalities, exclusive of isolated electric light plants, which reported the generation or utilization of electric current in commercial enterprises. These industries represent an outstanding capitalization of $6,209,746,753, of which amount $1,365,338,836 is credited to central electric stations, $3,774,722,096 to electric railways, $814,616,004 to commercial or mutual telephone companies, and $253,019,817 to telegraph companies.

¶The University of Paris has established a Chair of Aeronautics.

Courtesy the Sketch, London

Golf in a Dining Room

At a recent dinner at Nassau, the governing city of the Bahamas, a large banquet table was laid out in imitation of the court golf course. Miniature trees, bunkers, a lake, a bridge, and a putting green were represented. Several games were played, and prizes were given for the best approach to the hole. Miss Grey-Wilson, daughter of the governor, is shown standing on one end of the table, putting.

INGENIOUS TYPEWRITER-TURNTABLE

Two government clerks, employed in a small office having but one typewriting machine, devised an ingenious typewriter-turntable by which either could use the machine without leaving the desk chairs. The desks they occupy are in such position that they sit back to back, with 4 or 5 ft. of space intervening. In the center of this space was placed the specially constructed typewriter stand provided with a turntable. When either of them wishes to use the machine, he simply whirls about in his revolving chair, turns the typewriter into position, and sets to work. Both sides of the typewriter

Stand for Revolving Typewriter

desk are provided with drawers for stationery.

The typewriter support turns on two circular iron discs, one above and the other below the top, fastened together by a bolt.

NEW RESUSCITATION RULES ADOPTED BY LIFE-SAVING SERVICE

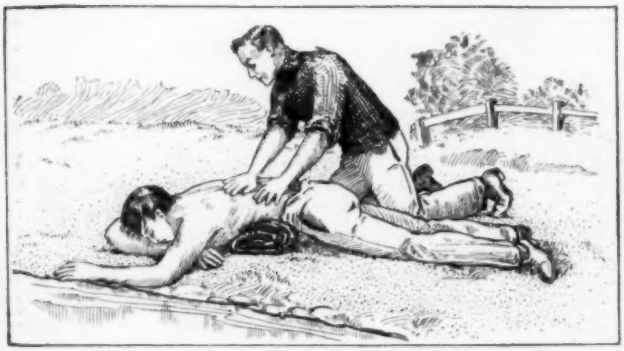


Fig. 1—Expelling Water from Body

THE United States Life-Saving Service has adopted new regulations for restoring the apparently drowned. Although the Howard method has been productive of excellent results in the practice of saving lives, the government has seen fit to combine it with the Sylvester method; the latter producing deeper inspiration, while the former effects the more complete expiration. The combination therefore of the two methods tends to produce the most rapid oxygenation of the blood—the real object to be gained. The government will urge the general public to familiarize itself with these rules that proper directions may be given in restoring the apparently drowned and thereby serve as a means of saving many lives annually.

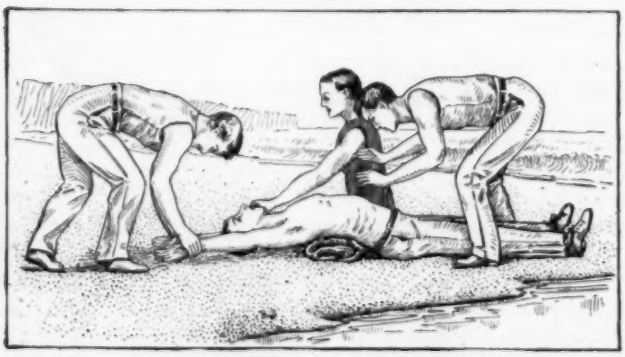


Fig. 2—Movements to Produce Inspiration

Rule I. Arouse the Patient.—Do not move the patient unless in danger of freezing; instantly expose the face to the air, toward the wind if there be any; wipe dry the mouth and nostrils; rip the clothing so as to expose the chest and waist; give two or three quick, smarting slaps on the chest with the open hand. If the patient does not revive, proceed immediately as follows:

Rule II. To Expel Water from the Stomach and Chest (See Fig. 1).—Separate the jaws and keep them apart by placing between the teeth a cork or small bit of wood; turn the patient on his face, a large bundle of tightly rolled clothing being placed beneath the stomach; press heavily on the back over it for half a minute, or as long as fluids flow freely from the mouth.

Rule III. To Produce Breathing (See Figs. 2 and 3).—Clear the mouth and throat of mucus by introducing into the throat the corner of a handkerchief wrapped closely around the forefinger; turn the patient on the back, the roll of clothing being so placed as to raise the pit of the stomach above the level of the rest of the body. Let an assistant with a handkerchief or piece of dry cloth draw the tip of the tongue out of one corner of the mouth (which prevents the tongue from falling back and chocking the entrance of the windpipe), and keep it projecting a little beyond the lips. Let another assistant grasp the arms just below the elbows and draw them steadily upward by the sides of the patient's head

to the ground, the hands nearly meeting (which enlarges the capacity of the chest and induces inspiration)—Fig. 2. While this is being done let a third assistant take position astride the patient's hips with his elbows resting upon his own knees, his hands extended ready for action. Next, let the assistant standing at the head turn down the patient's arms to the sides of the body, the assistant holding the tongue changing hands if necessary to let the arms pass. Just before the patient's hands reach the ground, the

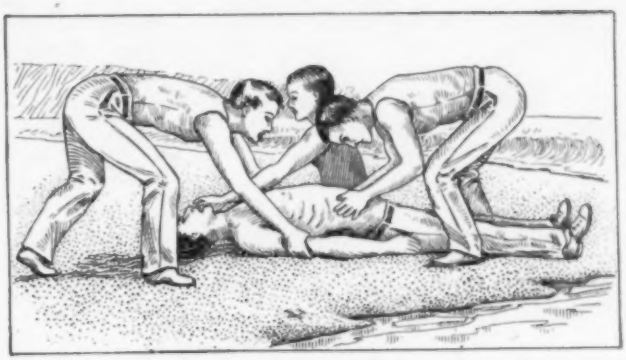


Fig. 3—Movements to Produce Expiration

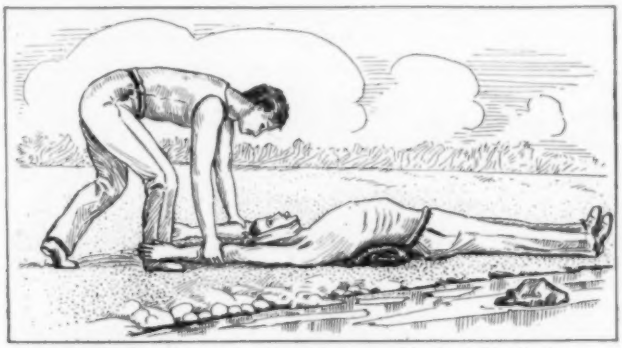


Fig. 4—Movements by One Person to Produce Inspiration

man astride the body will grasp the body with his hands, the balls of the thumbs resting on either side of the pit of the stomach, the fingers falling into the grooves between the short ribs. Now, using the knees as a pivot, he will, at the moment the patient's hands touch the ground, throw (not too suddenly) all his weight forward on his hands, and at the same time squeeze the waist between them as if he wished to force anything in the chest upward out of the mouth; he will deepen the pressure while he slowly counts one, two, three, four, then suddenly let go with a final push, which will spring him to his first position. This completes expiration. At the instant of his letting go, the man at the patient's head will again draw the arms steadily upward to the sides of the patient's head as before (the assistant holding the tongue again changing hands to let the arms pass if necessary), holding them there while he slowly counts one, two, three, four. Repeat these movements deliberately and perseveringly twelve to fifteen times in every minute—thus imitating the natural motions of breathing.

If natural breathing be not restored after a trial of the bellows movement for the space of about four minutes, then turn the patient a second time on

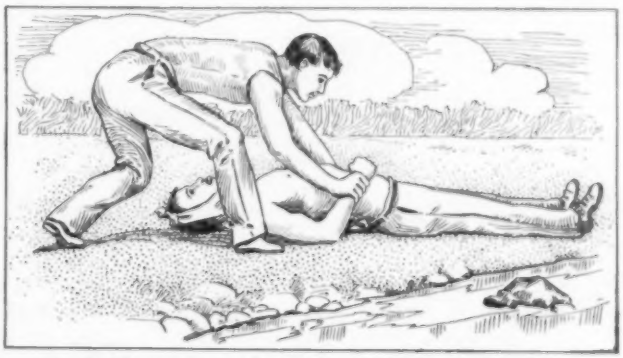


Fig. 5—Movements by One Person to Produce Expiration

the stomach, as directed in Rule II, rolling the body in the opposite direction from that in which it was first turned, for the purpose of freeing the air passage from any remaining water. Continue the artificial respiration from one to four hours, or until the patient breathes, according to Rule III; and for a while after the appearance of returning life, carefully aid the first short gasps until deepened into full breaths. Continue the drying and rubbing, which should have been unceasingly practiced from the beginning by assistants, taking care not to interfere with the means employed to produce breathing. Thus the limbs of the patient should be rubbed, always in an upward direction toward the body, with firm-grasping pressure and energy, using the bare hands, dry flannels or handkerchiefs, and continuing the friction under the blankets or over the dry clothing. The warmth of the body can also be promoted by the application of hot flannels to the stomach and armpits, bottles or bladders of hot water, heated bricks, etc., to the limbs and soles of the feet.

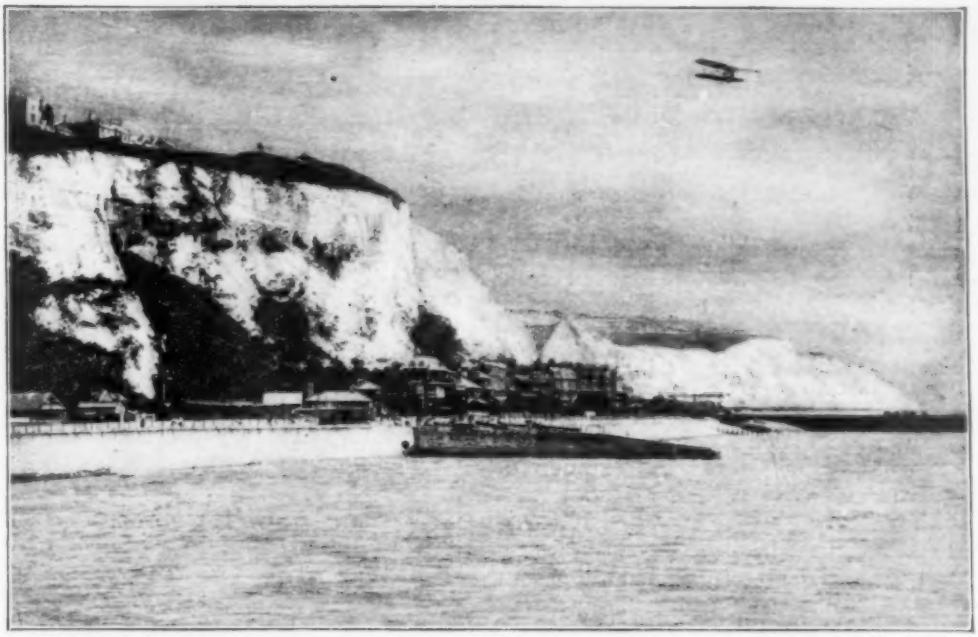
Rule IV. After-Treatment (Externally).—As soon as breathing is established let the patient be stripped of all wet clothing, wrapped in blankets only, put to bed comfortably warm, but with a free circulation of fresh air, and left to perfect rest. (Internally)—Give whisky or brandy and hot water in doses of a teaspoon to a tablespoon, according to the weight of the patient, or other stimulant at hand, every ten or fifteen minutes for the first hour, and as often thereafter as may seem expedient. (Later manifestations)—After reaction is fully established there is great danger of congestion of the lungs, and if perfect rest is not maintained for at least forty-eight hours it sometimes occurs that the patient is seized with great difficulty of breathing, and death is liable to follow unless immediate relief is afforded. In such cases apply a large mustard plaster over the breast. If the patient gasps for breath before the mustard takes effect, assist the breathing by carefully repeating the artificial respiration.

To Produce Respiration. (To be used after Rules I and II in case no assistance is at hand.)—If no assistance is at hand and one person must work alone, place the patient on his back with the shoulders slightly raised on a folded article of clothing; draw forward the tongue and keep it projecting just beyond the lips; if the lower jaw be lifted the teeth may be made to hold the tongue in place; it may be necessary to retain the tongue by passing a handkerchief under the chin and tying it over the head. Grasp the arms just below the elbows and draw them steadily upward, by the sides of the patient's head to the ground, the hands nearly meeting. (See Fig. 4.) Next lower the arms to the sides and press firmly downward and inward on the sides and in front of the chest over the lower ribs, drawing toward the patient's head. (See Fig. 5.) Repeat these movements twelve to fifteen times every minute.

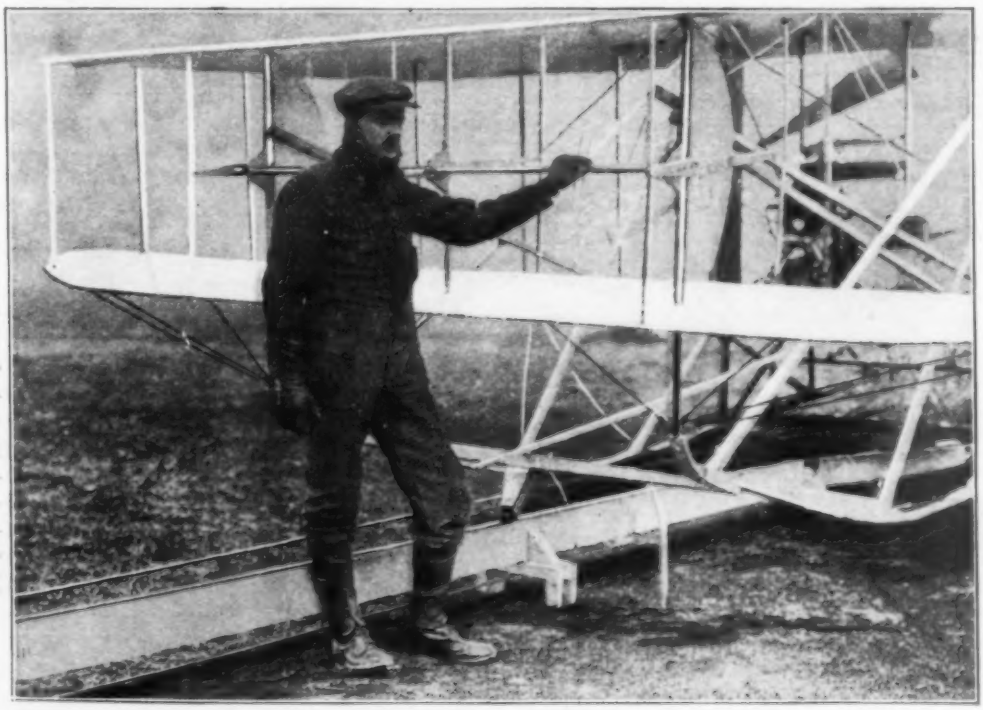
PARASITES CAUSE WHEAT SICKNESS

After 13 years of experiments, Professor H. J. Bolley of the University of North Dakota, announces that he has discovered five distinct types of parasites which cause the several varieties of wheat sickness. The fungi resemble in shape and in action on plant life the tuberculosis germs which afflict humanity. The five distinct parasites, according to Professor Bolley, came to afflict the world's soils from the same unknown cause which gave birth to the bacilli of tuberculosis. They were carried by water and wind, and especially by blown straw in threshing time, farther and farther out over the world.

The cure for wheat sickness is a proper rotation of crops, being chiefly clover, corn, and potatoes, until tests of lands show the absence of the parasitical fungi.



Nearing the White Cliffs of Dover at the End of the Flight from England to France and Return



Captain C. S. Rolls Directing Final Preparations for His Flight

THE ROUND-TRIP FLIGHT ACROSS THE ENGLISH CHANNEL

WHILE two Frenchmen, Louis Bleriot and Count de Lesseps, had crossed the English Channel in aeroplanes, it remained for an Englishman in an American machine to make a round trip. This was accomplished by Capt. Charles S. Rolls, on June 2. He used a Wright machine. The distance between Dover and Calais, France, his destination on the continent, is 21 miles, and the overwater flight of 42 miles without a stop established a new record. The flight was made in 90 minutes.

FIRST AERIAL PASSENGER AIRSHIP MEETS DISASTER

On June 22nd the "Deutschland," Count Zeppelin's latest and most powerful airship, opened a passenger service between Friederichshafen and Düsseldorf, Germany. A week later the air liner suffered the fate of several of its predecessors, and lay, crumpled and torn, a helpless wreck, on the branches of the great trees of a dense forest.

The initial trip between Friederichshafen and Düsseldorf, a distance of 300 miles, was made in nine hours, without the slightest mishap. Although buffeted about by the gale on its final trip, the airship was kept under control for a long time, Count Zeppelin on several occasions rising to great heights to avoid threatening whirlwinds. Varying accounts ascribe the disaster, respectively, to the stopping of one of the motors, to exhaustion of the gasoline supply, and to leakage of gas from the great gas bags. Thirty-three men were aboard the "Deutschland" when it was wrecked, 20 passengers, the crew of 12 men, and the builder. All escaped without injury, using rope ladders to reach the ground.

The airship was 485 ft. long and 46 ft. beam. The capacity of the gas envelope was 24,852 cu. yd. This gave it a lifting power of 44,000 lb. The motors developed 300 hp. The passenger arrangements were luxurious, the cabin resembling a sleeping-car of the finest model. It was carpeted, and the mahogany woodwork inlaid with mother of pearl.

¶ In an article on a producer-gas automobile in the July issue, the following sentence, comparing the producer-gas motor vehicle with the gasoline type, appeared:

> "Gasoline costs 26 cents per gallon in Scotland, and the same load, run over the same course by a gasoline engine, would take *twenty-six* gal. of this fuel, making the total cost $2.86."

It should have read *eleven* gal. The error was a typographical one.

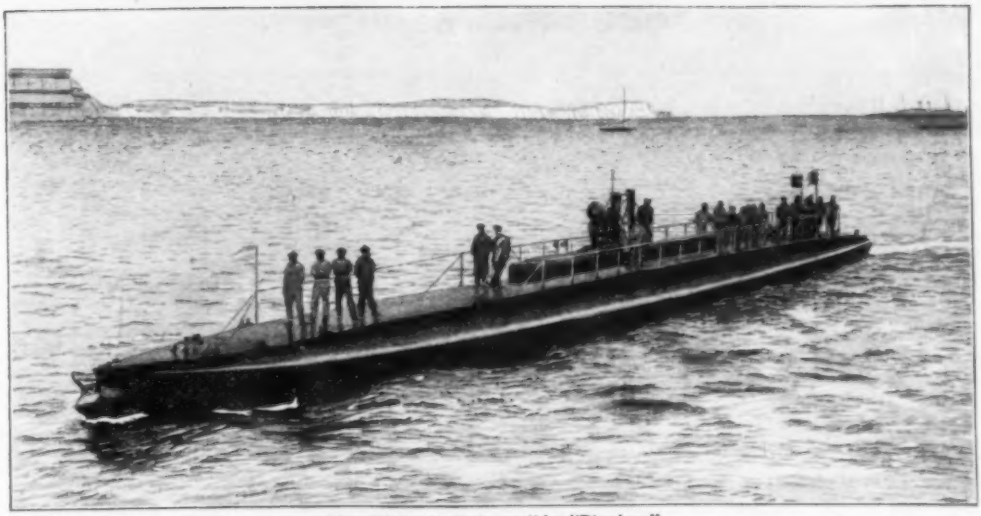
THE SINKING OF THE FRENCH SUBMERSIBLE "PLUVIOSE"

The danger incident to the operation of submarines and submersibles was emphasized recently when the French submersible, "Pluviose," was sunk in the English Channel by the steamer "Pas de Calais." The steamer was crossing the channel from Calais to Dover when it struck something in the water which the officers of the ship thought was a log. A few minutes later the bow of the injured submersible rose above the surface. For 15 minutes the bow showed above the water. A boat was lowered, but blows on the metal bow drew no response from the 26 men caged within. Suddenly the bow disappeared, the ship's boat barely escaping the vortex, and the only visible sign of the disaster was the oil floating on the surface.

Desperate efforts were made for the next two or three days to reach the doomed vessel. Divers were sent down and found her at a depth of 72 ft. Finally heavy chains were bound around the wreck, attached to large barges, and the vessel towed to the docks in this manner. The collision had torn a great hole in the hull. The death of the crew, by drowning, probably occurred during the first few minutes the bow showed above water.

The little under-water fighters of the world navies are of two types, submersibles and submarines. The "Pluviose" was of the former. The main distinction is as follows: The submersible is a vessel which can be submerged when desired, but whose normal condition is on the surface, while the submarine is an under-water vessel, which only rises in order to take in a supply of air. Submersibles are sunk partly by the admission of water into their ballast-tanks, and then by the force of propulsion, being forced downward by diving-rudders.

In submarines the motive power is electricity, which is stored in accumulators. In submersibles there are two distinct means of propulsion—an

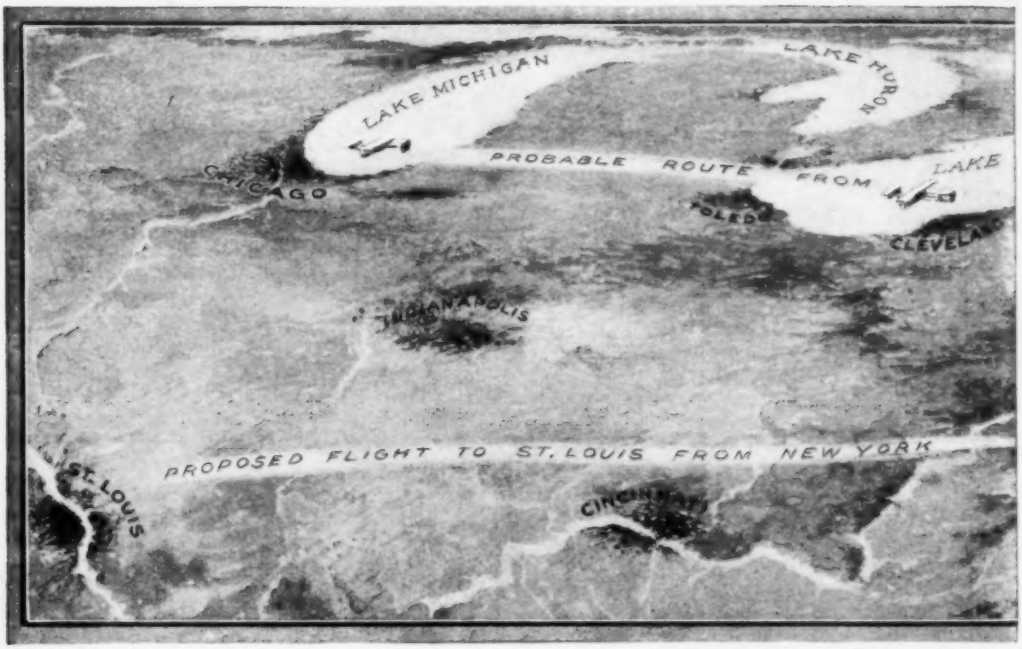


The Ill-Fated Submersible "Pluviose"

The Tragedy as Viewed from the Decks of the Channel Steamer

Oil Floating on Surface Above the Doomed Craft

How the Wreck Was Carried to the Docks by Barges



View Showing the Proposed Routes of

electric motor for use under water, and a gasoline or steam engine for propelling the vessel on the surface.

In war, submarines would operate near their own coast, and would protect harbors against an invading fleet. Submersibles, as sea-going vessels of the torpedo-boat type, would accompany fleets and attack the enemy's vessels.

The "Pluviose" was one of a class of 18 submersibles of the French navy. She had a displacement of 398 tons, and a maximum speed of about 14 miles above water, and 10 miles below.

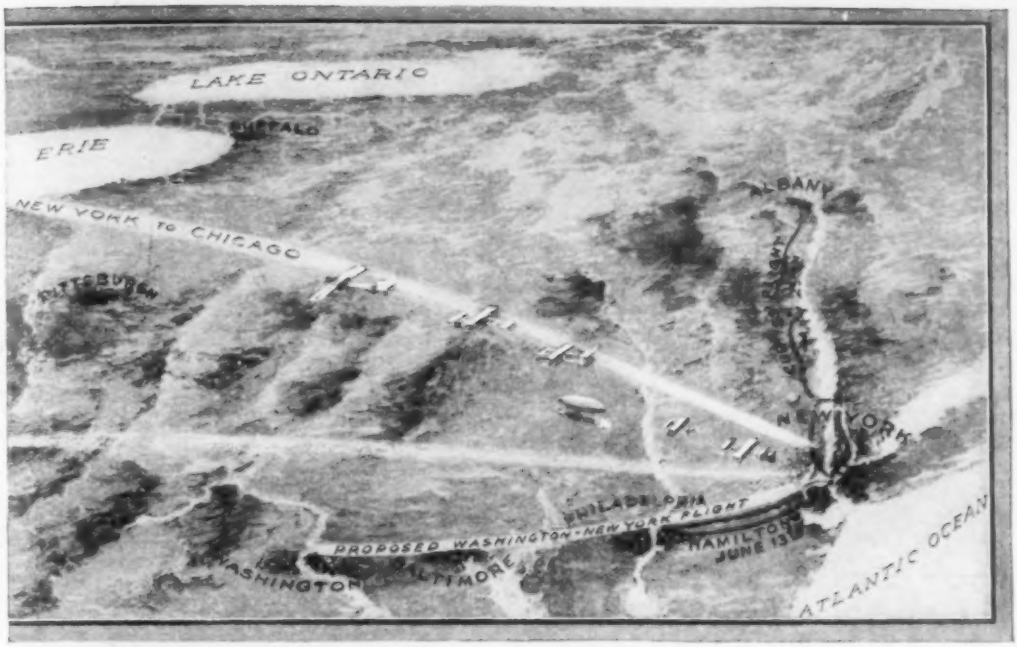
¶Aviator Bleriot, while serving his term of military service recently, carried dispatches in his aeroplane from Chalons to Paris, this being the first time military dispatches were ever sent by such a means.

¶Gasoline, which flowed into the sewers from automobile garages, caused an explosion in New York recently, throwing nine iron manholes covers high into the air.

PROPOSED NEW YORK TO CHICAGO AEROPLANE TRIP

The enthusiasm engendered by the flight from London to Manchester by Paulhan, the round trip over the English Channel by Captain Rolls, the Albany to New York flight by Curtiss and the round trip from New York to Philadelphia and back by Hamilton, have created a widespread faith in the ability of aeroplanes to negotiate still longer flights, and encouraged aviators to greater effort.

A number of long-distance flights have been proposed, large prizes having already been offered. The three principal events tentatively scheduled are from New York to Chicago, New York to St. Louis, and New York to Washington. It is not thought that any of these flights will be attempted before the fall. A committee is now working out rules to govern the New York to Chicago flight. This committee will settle upon the number of stops to be allowed and the exact route.



Contemplated Long-Distance Aeroplane Flights

FORTIFICATION PLANS FOR PANAMA CANAL

Although details are still lacking and many changes will undoubtedly be made, the plans for the fortification of the Panama canal, it is said, will call for defences upon three small islands off the coast on the Pacific side, and a fort on the Pacific mainland. At the Atlantic end of the canal there will be two forts on the mainland on either side of the mouth of the canal. The armament of the forts, as at present contemplated, will be 14-in. disappearing guns, mortars, and secondary batteries of 6-in. quick-firing guns.

The forts are to be manned by the coast artillery corps, reinforced by a garrison of some 4,000 men of all arms, to be stationed in barracks at different points upon the higher ground of the Isthmus.

The mortars may be of a different pattern than those hitherto used in American coast defense. The present weapon throws a projectile weighing 1,000 lb., and has an effective range of 10,000 yd., while the contemplated weapon will only throw a projectile weighing 700 lb., but having an effective range of 17,000 yd.

SKELETON OF ABORIGINAL HOG

A huge skeleton which the zoologists of the Nebraska University declare to be the skeleton of an aboriginal hog has been found embedded in sandstone in northwestern Nebraska. Possibly 100,000 years ago, or it may have been several hundred thousand years, the great animal existed.

If the conclusions of the zoologists are right this prehistoric hog weighed in the neighborhood of 6,000 lb., stood 10 ft. high at the shoulders, and had tusks like the horns of a Texas steer.

¶According to the Far Eastern Review, China has ordered two cruisers, two coast defense vessels, two dispatch boats, six torpedo destroyers and four torpedo boats. These will be the nucleus of the new Chinese Navy.

The Head Chef of the Future Submitting Food to a Microscopic Analysis

Microscope as Kitchen Utensil

The food experts of the Department of Agriculture recommend a powerful microscope as a necessary kitchen utensil for large establishments. The use of such an instrument in detecting adulteration in various common food products requires some amount of knowledge, but this is readily gained with a little experience. The characteristics of the different starch products, for instance, under a microscope with a magnifying power ranging from 50 to 400 diameters are easily learned.

"To the naked eye all these starches appear as a fine white powder," says the bureau of chemistry, "but under the microscope, grains or granules are seen which vary more or less in shape, size, rings, etc. In the case of potato starch, for example, the grains are large, with smooth outlines, while rice starch has small grains with angular outlines. Potato starch adulterated with cornstarch can be easily detected, as the grains of the latter have an angular form. In the case of spices, most of the substances used for adulteration have a structure very different from the genuine articles. Although pepper adulterated with ground peas or beans may not always be detected, even by means of the chemical test of the expert, especially when olive pits or pepper shells have been added to counteract the excess of starch present in the peas, the microscope will reveal such adulteration at once by showing the presence of large starch grains characteristic of certain legumes.

"The microscope is also a thoroughly efficient detector of adulteration of coffee and chocolate preparations. In the former, roasted chicory, cereals, and peas, and in the lattter, starchy material and cocoa shells, are sometimes used. Coffee, being the seed of a plant, has a structure which is very different from chicory, which is a root. The cell walls of coffee have a beaded appearance which is present in but few other seeds. Even after roasting and grinding, these beads can be easily distinguished, while chicory contains sap vessels which can be just as easily detected.

"Artificial jellies, jams and some kinds of confections are often thickened with gelatine, starch, gum tragacanth, and gum arabic. A thickener of cream often used is a substance composed of cornstarch and gum tragacanth. The cornstarch, under the microscope, appears as the angular particles, while the streaky substances near the center of the field are swollen fragments of the gum."

ENGLISH AVIATOR FLIES TO POLICE COURT

Claude Grahame White, Paulhan's famous rival in the London-Manchester flight, was summoned a short time ago to appear in court for exceeding the 20-mile speed limit in his automobile. When the summons was served he conceived the idea of aeroplaning from Brooklands to the police court, and, accordingly, on the day he was to appear, started through the air, where no speed laws have yet been enforced.

Leaving Brooklands at 6.30 a. m., the aviator made a 6-mile flight in 8 minutes, passing over Woking, the place in which the court was held, and landing in a field just beyond. He flew over Woking at a height of less than 100 ft., his appearance causing great excitement. He waited some time at court before his case came up, and then pleaded guilty.

During the hours he was away from his machine, which was left in charge of a mechanic, the farmer who owned the meadow in which the aviator had alighted charged sixpence per head for admission, and this fee was willingly paid by nearly 2,000 people. His profit, therefore, was something more than $200 in American money.

¶A New York hotel has installed scales in all the larger suites.

NEW YORK TO PHILADELPHIA IN AN AEROPLANE

Flying on a schedule as "Extra No. 1," and reported all along the route by railroad dispatchers of the Pennsylvania road, Charles K Hamilton, one of the foremost of American aviators, made a flight from Governor's Island, New York harbor, to Philadelphia and return on June 13th, rivaling the feat accomplished by Glenn H. Curtiss a few weeks previously, when that air pilot made a sensational flight from Albany to New York, following the course of the Hudson river.

CHARLES K. HAMILTON

Note worn condition of sleeves of leather coat near shoulders. This is caused by steel crotch on Curtiss machines which sets closely on either side of operator. The sidewise swinging of the body in this crotch controls the operation of the ailerons which govern the lateral balance.

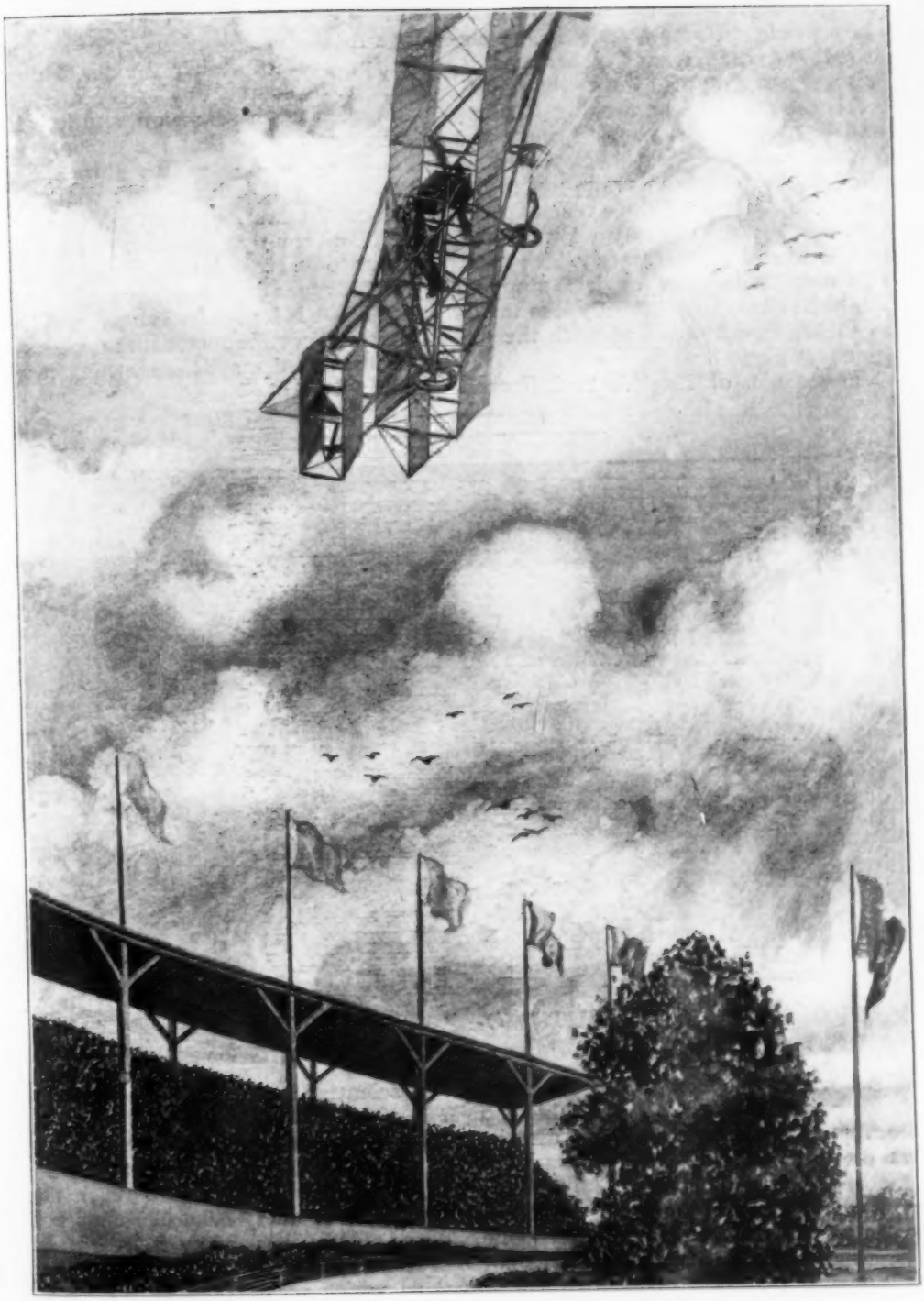
It was the first round trip ever undertaken by an aeroplane between two large centers of population. The distance traveled was 175 miles. Hamilton was in the air 3 hours and 34 minutes. He flew from New York to Philadelphia in 1 hour and 50 minutes. His average speed on the trips to the Quaker City was 46.92 miles per hour, but returning he averaged 51.36 miles per hour. He used a Curtiss biplane.

The flight was aided by favorable weather conditions, and the only interruption was caused by the sooting of spark plugs in the motor. This necessitated his descent at South Amboy, N. J., on the return trip. In making the landing at that point one of the blades of his propeller was splintered. A new one was sent out from New York, the spark plugs were cleaned, and the flight continued back to Governor's Island.

"THE AERIAL DIVE"

Not content with the ordinary dangers of aerial flight, a few intrepid aviators, among whom are an American, a Frenchman and an Englishman, have thrilled vast crowds by performing the "aerial dive." This is a "thriller" infinitely more hair-raising than anything of the high dive or automobile loop-the-loop kind of acts ever seen in a circus, and consists of flying to a great height, stopping the engine, reversing the direction of the elevating plane, and shooting downward at a high speed.

The first real "aerial dive" executed by an American was by Hamilton, at Mineola, L. I., in June. Rising to a height of 1,000 ft., and without even stopping his engine, as do the English and French aviators, he pointed his horizontal rudder almost straight to earth, and shot downward. Just when



A Feat That Makes the Circus Thriller Look Tame

the spectators were beginning to think they would witness a tragedy, he elevated the rudder, and soared away, missing the ground by less than 50 ft.

To the spectators watching Paulhan and Bartram Dickson, the French and English aerial divers, it appeared as though the men were dropping to destruction, but just before reaching the ground they dexterously righted their machines and alighted safely. The trick, however, with the engine stopped, might be considered slightly less thrilling than Hamilton's feat with the engine working.

Thousands of English and French have gone to the recent aviation meetings in the two countries for the special purpose of seeing the aerial dive. This is, of course, due to the ever existing desire for sensation, and it is interesting to note that the demand for such feats is one of the things that shows the great advance in aerial navigation. At first, simple flying was in itself sufficiently wonderful and dangerous to be sensational. But, through great advance in the science, the ordinary flight is losing its danger, and has become so commonplace that the seeker of sensation demands something more thrilling.

Made 53 Miles an Hour

PROPELLER-DRIVEN AUTOMOBILE MAKES FAST TIME

An average speed of 53 miles an hour was developed by this vehicle, a combination of automobile and airship. It was tried out on the Indianapolis motor speedway recently. The propeller was driven by a shaft connected with the drive shaft of the automobile by a link belt. The drive shaft was not connected with the differential. The propeller was made of wood and was 8 ft. long.

THE INFANT DEATH RATE AMONG OYSTERS

A scientific investigator of oyster life, referring to the enormous output of eggs compared with the ultimate crop of oysters returned, says that only one oyster may be expected to reach maturity out of every 5,000,000 eggs produced. It is very lucky indeed to escape its enemies or unfavorable conditions which may kill it in the period of five to seven years required to reach the adult stage.

EDITORIAL

THE loss of the French torpedo boat, "Pluviose," was made the occasion of expressions of the most friendly character by the press of Europe, especially that of England. Naval authorities are unanimous in the conviction that the disaster confirms an opinion which has been quite general—that the submarine must be considered an auxiliary to larger craft, and not as an independent unit. One prominent official phrased it thus: "The submarine must have a battleship as its wet nurse."

The accident also emphasizes the truth that the submarine offers the most dangerous work known to army or naval undertakings, not excepting dirigibles and aeroplanes. Notwithstanding the fact that the "Pluviose" did not sink for fully fifteen minutes after she was struck, the crew were unable to escape by the means provided for just such an emergency. This forces the conviction that naval constructors have practically failed in their efforts to furnish any dependable means of escape.

No invention has ever occasioned so much real anxiety as the submarine, the chief reason for which is undoubtedly the universal fear of a hidden and mysterious danger. Savages and the best trained men of modern civilization have shared the same fear. However, the history of submarines to date has been a record where all the known loss of life has been, not to an enemy, but to those engaged in operating them.

It does not follow from this that the submarine will not yet make a glorious record for itself, but evidently the present type of construction is still far from perfect.

* * *

IN a recent address before the Institution of Naval Architects (England), Rear-Admiral Bacon maintains that in the near future the battleship will no longer be the self-contained unit of today, but will be accompanied by a large armored cruiser and a fleet of torpedo craft. The naval battle will then become an aggregation of duels between two battleships, in which their cruisers and torpedo flotilla will act largely as defenses for the battleships to which they are attached; the smaller craft to keep the opposing torpedo boats at a safe distance, while the battleships hammer each other with heavy guns at what is now long range.

* * *

THAT great explorer, Hudson, when gazing for the first time upon the waters of the vast bay which will forever bear his name, could not possibly have dreamed of what will soon be an accomplished fact. Thirty years ago a survey was made for a railway from the wheat fields of Manitoba to a prospective port on Hudson Bay. The project was one generation in advance of the times, and would have been a failure in those days. What was then a vast wilderness in Manitoba, Saskatchewan, Alberta and British Columbia, is today a great world's factor in the production of wheat. Thousands of miles of recently constructed railroads have developed and are developing these provinces at a rate without parallel in the history of the world.

The chief production of this new agricultural empire is wheat, which finds its largest market in Europe. The distance from the new port on Hudson Bay to Liverpool is considerably shorter than from New York, while the rail haul to port of shipment is also very greatly reduced. Not only will there be created a great freight traffic via this new route, but passengers from Chicago and west will undoubtedly enjoy lower rates than via present Atlantic seaboard ports, while the scenic attractions will draw thousands from the Eastern States.

From the Indian with his paddle and canoe and furs for barter to the modern leviathan with passenger elevators and wireless and thousands of tons of cargo, in a single generation, furnishes one of the most striking contrasts of twentieth century accomplishments.

* * *

THROUGH bills introduced in Congress from time to time, and as a result of attempts on the part of newspaper writers who draw more on their imagination than on facts for their writings, reports are circulated from time to time that the patent system of the United States is not only a source of governmental expense which is not warranted by the results, but that the patents them-

selves which are issued by the government are either a delusion or are used by the owners for purposes of oppression, or to create unjust monopolies, or to hold up the public for exorbitant profits. Of course, a thorough investigation of the real facts and an impartial report of the general effect of the patent system in this country would not be sensational, and hence, from the standpoint of the penny-a-liner, would not make a "good story."

A system of granting patents has been in vogue in Great Britain, Germany, France and other European countries for several centuries; and while the statutes controlling the grant of patents in the United States are based on the British patent law, they contain provisions which have been found to be desirable from the standpoint of the inventor and the public as well.

Within a short time, Great Britain has amended its laws to conform in at least one important respect with the laws of the United States. Prior to 1907, Great Britain would grant a patent to any applicant for almost any invention, provided the papers were in proper form. No attempt was made by the British patent authorities to determine whether the invention had previously been patented in Great Britain or not. The rights of the respective patentees of the same article had to be adjusted in the courts. This has now been changed, and the applicant for a patent in Great Britain will not be granted a patent unless his invention has not been previously patented in that country, in this respect following the laws and practice in the United States.

Up to the present time nearly a million patents have been granted by the United States, and while it is true that many of these patents are for inventions that have never been introduced, and are of such a character as to be uncommercial and should never have been patented, it is undoubtedly a fact that the influence in the development of this country by thousands of these patents has been greater than any other factor.

Whereas, originally patents were granted by a board composed of the President of the United States, the Secretary of State and the Attorney General—and one of the first patents bears the signature of President George Washington—it now requires an organization composed of a Commissioner of Patents, two Assistant Commissioners, several official boards and several hundred examiners, to handle the current business of the United States Patent Office. The expenses of conducting the Patent Office for the year 1909 were not quite two million dollars, but the receipts were eighty-seven thousand dollars in excess of the expenses.

The Patent Office is the only Bureau of the Government that is self-sustaining. During the time that it has been in existence it has turned into the Treasury of the United States, as surplus earnings, nearly seven million dollars.

H. H. WINDSOR.

THE VIOLIN

SYCAMORE that spread a shade,
Where the blackbird, unafraid,
Singing in you, music made;
Pine that murmured of the breeze
Where you leaned to summer seas,
Wood, that once was living tree,
Let the dumb now speak through thee.

Hidden things that know no way
Out into the light of day,
Captives watching for a ray,
Dreamers by some temple gate
Who for moving waters wait,
Wonder-working wood, let me
Touch your strings and set them free.

Bound—you open wide the doors,
Dumb—a voice they find in yours,
Dry—through you the fountain pours,
Inarticulate—they talk,
Paralyzed—they rise and walk.
Wood of magic, haunted tree,
Thus you lay your spells on me.

Till, within a charmed ring
Half-created things shall spring
Into being while you sing,
Crowding in a countless throng,
Crying with a new-found tongue,
Wood of Orpheus, wood of Pan,
Loud you sing the soul of man.

Marna Pease, in the London Spectator.

Canvas Rain Protection for Street Trench

A RECORD IN TELEPHONE CONSTRUCTION

A race to prevent the possible loss of a valuable telephone franchise in Omaha recently resulted in the breaking of all records for telephone construction work. The Omaha company found itself facing the imminent forfeiture of the South Omaha franchise, which, with its big stockyards business, needed the connection. If an exchange were not working within six weeks, the company's rights would be endangered.

No attempt was made to shift or dodge the issue. The company decided that South Omaha should have its exchange—not a temporary makeshift, but a permanent building, with underground cables and full equipment to do business permanently.

In the afternoon of April 11, a court order was issued authorizing construction to be undertaken, and from that moment until the last day of grace, May 23, the struggle was continuous. On the morning of April 12 the lot for the building was surveyed, and contracts were made with the architect and the builder. The architect drew up pencil sketches of the general plan, and these sufficed to start work, details being figured out from day to day as the work progressed. On the morning of April 13 men were excavating the cellar. A few days after it began to rain, and from then on until the end there was hardly one whole pleasant day. The bricklayers were obliged to quit because of the steady rain, but were almost immediately sent back to work again under canvas, scaffoldings being erected to hold awnings. One of the illustrations shows the completed building 35 days after the survey was made. It is a steel frame building with brick walls, 40 by 85 ft.; two stories, with 13-ft. ceilings.

While the building was being erected, work was progressing with the same rush on the trench work. Plans were filed with the city on April 12, 13, and 14, and on April 19, 180,000 duct feet of conduits, in 2, 3, 4, and 6-duct sizes, were ordered from Chicago. Nine days later three carloads were received in South Omaha. The balance came in as needed, and rainstorms were the most serious danger to completion of the task on time. On the second day of the rain the men refused to work in the wet ditch, and, as the excavation was in soft clay, there

was serious danger of the sides caving in. Canvas was immediately telephoned for, and a short time later the ground work presented the tented ap-

Courtesy Telephony

Exchange Built in 35 Days

pearance shown in another of the photographs.

The first connection between telephones was put through on the morning of May 21, forty days after the order was signed authorizing construction. On May 28, eleven days after starting the installation, the complete switching equipment for 1,000 lines was ready for occupation in every respect. No temporary work was done, everything being completed as the work progressed.

"A telephone exchange," says a writer in Telephony, "is usually built after weeks or months of careful planning. The building plans are rough-drawn and worked over by the architects and the engineers. Then they go to the manufacturer of the equipment. Here they are checked and criticised by experts, and finally the permanent plans are drawn. The manufacture of equipment and the construction of the building can then be taken up at the same time, and when the building is ready the manufacturer knows just how his equipment will be housed. Everything is worked out and put on paper, conduit, manholes, cable work, all being mapped out and set down in systematic records. The South Omaha exchange was not built this way, but never did a construction force, working under pressure and in nerve-racking weather, do better work."

ENGLISH START FOR SOUTH POLE—JAPAN ENTERS RACE

The English exploration ship "Terra Nova" with Captain Scott and his polar expedition is now well on its way to the Antarctic. Captain Scott expects to reach the South Pole on Dec. 11, 1911, the day on which the sun reaches its maximum altitude at the far end of the earth. On that day the sun describes a circle at the pole of the same altitude all round, so that, by means of specially constructed theodolites, the location of it can be fixed within one mile.

According to present plans Captain Scott expects to land an exploring party of from 22 to 25 men at McMurdo Sound sometime in the latter part of December, 1910. Then, a little later, a party of six or eight men will be landed at King Edward's Land, and the "Terra Nova" will visit New Zealand and make further exploration. The main expedition will probably start its dash to the pole from McMurdo Sound in October, 1911. Before that time the "Terra Nova" will have returned from New Zealand, and the members of the expedition will be thoroughly hardened for the hardships to be encountered.

A Japanese expedition under Lieut. Shirane has made preparations to compete with the United States and England in the race to reach the South Pole, and is now, unless delayed by change of plans, on its way to the Antarctic. A petition for funds for the expedition was granted by the Imperial Diet in a recent session, and Lieut. Shirane prepared to start from Japan in June.

¶W. W. Brookins, in a Wright machine, broke the world's record for height in an aeroplane, when he reached an altitude of 4,384½ ft. at Indianapolis, Ind., on June 13.

¶An eastern railroad is building a germ-proof dining car, the interior of which will be devoid of carved work, moulding, or any projections.

AERIAL PUSH-BALL IN ARMY TOURNAMENT

A new English game, played on horses by the Royal Horse Guards, was to have been staged as one of the contests in the Royal Naval and Military Tournament, which was postponed by the death of King Edward. The ball, which is filled with gas and looks like a large-sized toy balloon, has to be knocked through such goals as the one shown in the illustration with the aid of wooden rods or wands.

Fighting for a Goal

A TALE OF THE COMET

One of the strangest of all the stories about the recent visit of Halley's comet is told in the Japanese Times. Some ten miles east of Utsunomiya in Japan, there is a village, away from the current of twentieth century civilization. The inhabitants are still leading a primitive life, as may be judged from the fact that the shrine of Jizo in the village is regarded by the people as a protector of all mankind. Such being the case, when the keeper of the shrine told the innocent people that in a short time, there would appear a "broom-star" as the comet is called in Japanese, and that on that day a rain of blood would come down and human beings would be annihilated, they took him at his word. The keeper further said that this calamity could only be avoided by presenting offerings to Jizo. The result was that the shrine was crowded with offerings of great value and the village turned into a Mecca, for the people of the neighbouring villages, hearing of the virtue of Jizo, all came on a pilgrimage. The keeper chuckled to himself, when he glanced over the pile of offerings. The indicated day came, but there was no change on the face of the earth, nor was humanity destroyed. The villagers were wild with anger, and made a raid upon the mischievous shrine-keeper, and subjected him to a severe beating.

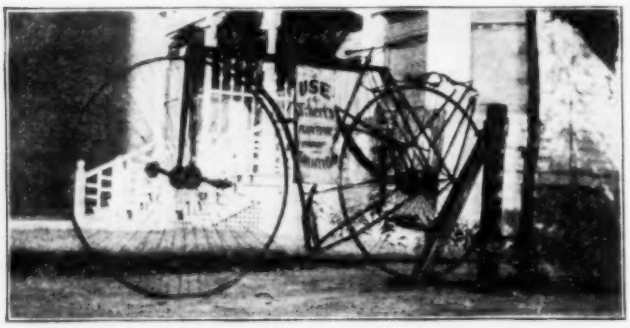
OYSTER CATCHES MOUSE

One of the most remarkable mouse captures ever recorded was that of an oyster in the larder of an establishment in Colchester, England. The mouse was searching for food and nibbled at the dainty morsel presented to view in an open oyster shell. The result was disastrous, the oyster closing its shell and catching the mouse as shown in the illustration. Attention was drawn to the capture by the squeaking of the prisoner.

A Live Mouse Trap

A SANDWICH SLOT-MACHINE

A western inventor has devised a slot-machine for the vending of sandwiches. In the center of the machine



A Vehicle of Which Much Was Expected

is a refrigerating device to keep the food in good condition. All the purchaser has to do is drop his coin in the slot and press a lever. The sandwiches not sold are supposed to be taken out every day and fresh ones substituted.

PUSHING A BARREL AROUND THE WORLD

Every month or so someone, from some part of the world, starts out to do a more or less unique walking "stunt," taking a number of years in which to accomplish it. In the accompanying illustration may be seen two Italians who have started out to push a barrel round the world on a wager of $7,500 each. They started from Venice a little more than a year ago, and they do not expect to complete their journey in less than 12 years. Inside the barrel is a sliding carriage which always remains level, and on this are carried provisions, clothing, camp utensils, and tent. A dog, seemingly not as content to walk around the world as its masters, is also seen occupying it.

A FOUR-PASSENGER BICYCLE

This fearful and wonderful contraption was tinkered together by a Los Angeles bicycle man, who used for that purpose two old high-wheelers of approved models in the year 1887. One of them had a little wheel behind, the other had a little wheel in front, so the removal of the small wheels provided a good point of meeting for the two high wheels; for, as the picture shows, the small forks are hitched together in some mysterious way. As weight was no object in the manufacture of this novel vehicle, the frame which connects the two handle bars is built of a couple of 1-in. iron bars, an eighth of an inch thick. This allows ample room for additional passengers and therefore the inventor placed four saddles on his machine, although it seems exceedingly doubtful that it ever carried that many.

A bit of gentle sarcasm directed at the old-fashioned solid tires is the advertisement of somebody's preventive of punctures, attached to the frame.

Curious World-Walking Stunt

¶The City of Mexico is building a city prison which will contain 1,900 separate cells, and will be a model of construction.

MACHINE HANGS WALLPAPER

Wallpaper is trimmed, hung and pasted by a new machine invented by a decorator in St. Joseph, Mo. It consists of a small carrier for the roll of paper, which unwinds and feeds across a paste-container, while at the same time a set of knives trim it accurately. When papering a ceiling, the operator fastens the apparatus to his waist, mounts the scaffold, and walks along it, hanging the paper as he goes. In papering the walls, he may set the machine on the floor near the wall, climb a ladder and pull the paper out of the machine, pressing it against the wall.

A UNIQUE PLACE OF WORSHIP

When a railway car is condemned by the officials of the line as being out of date or beyond repair, it is generally broken up for firewood; but scattered here and there one may observe some strange and novel uses to which enterprising persons have put old railway passenger coaches and freight cars.

The one shown in the photograph is used as a place of worship near a small village about 20 miles outside London. The car which formerly ran many miles on the Great Northern railway, has had its compartment partitions removed and chairs arranged forming a central aisle with an entrance at one end as in a corridor train.

A Sculptured Brick Fireplace

NOVEL BRICK SCULPTURE

Novel and artistic sculpture on the face of a brick fireplace is shown in this illustration. The carving is in flat bas-relief, and drew much attention at the exhibit of the Architectural League in New York.

Old Railway Car Used as Church—Accommodates 60 People

INGENIOUS ELECTRIC FLOOR-SCRUBBER

Electric floor machines for removing old finishes, waxing, polishing, etc., have been on the market for some time, but the machine shown in the accompanying illustration may be used for the added purpose of scrubbing as well. It weighs less than 50 lb. and is simple in construction, all working parts being packed in grease and enclosed within a dust and water-proof case.

When not in active operation the machine rides on casters, but after the motor is started the handle is slightly raised, which action withdraws the casters from the floor, allowing the machine to be propelled over it by the whirling brush. The water is carried in a tank attached to the handle, and is fed through a hose to the brush. Around the brush, with a couple of inches intervening, is a ring which incloses all but the front. The ring keeps the bulk of the water with the machine, instead of allowing it to spread over the floor, and thus eliminates much extra work in mopping up.

When the machine is to be used for floor-polishing and like uses, the tank and brush are removed, and the required attachments substituted.

THE TAILOR OF A BATTLESHIP

Every battleship in the U. S. navy has at least one sailor who is sufficiently proficient in the art of tailoring to be detailed for this work and have $20 a month added to his regular pay. He is also allowed a helper, who is paid $10 a month extra. The duty for which the government pays him this extra compensation is the changing of uniforms to make them fit the owners. He also has many opportunities for making still more money, some of which are the cleaning and pressing of the officer's clothes, repairing uniforms, and making new clothes.

The illustration shows a battleship tailor seated cross-legged behind his hand-operated sewing machine, which rests upon a low bench.

Tailoring Shop of a Battleship

THE HUMAN FACTOR IN PUBLIC UTILITY REGULATION

By J. Q. ROBERTS

IT would seem that one of the last places on earth to look for students of human nature would be the engineering offices of a state railroad commission. The character of such an organization suggests, rather, dull facts and figures, dry statistics and diagrams, musty blueprints and estimates, material things such as iron and stone and cement, stresses and pressures, strength of materials and motive power.

The psychologist, the man who devotes his life to the study of the human mind and its intricacies, makes his observations in the crowded city tenements, in hospitals, in the research laboratories of great universities. His conclusions, largely theories, are set forth in books full of lore, which have an honored place in scientific libraries, but which rarely have any effect on every-day affairs.

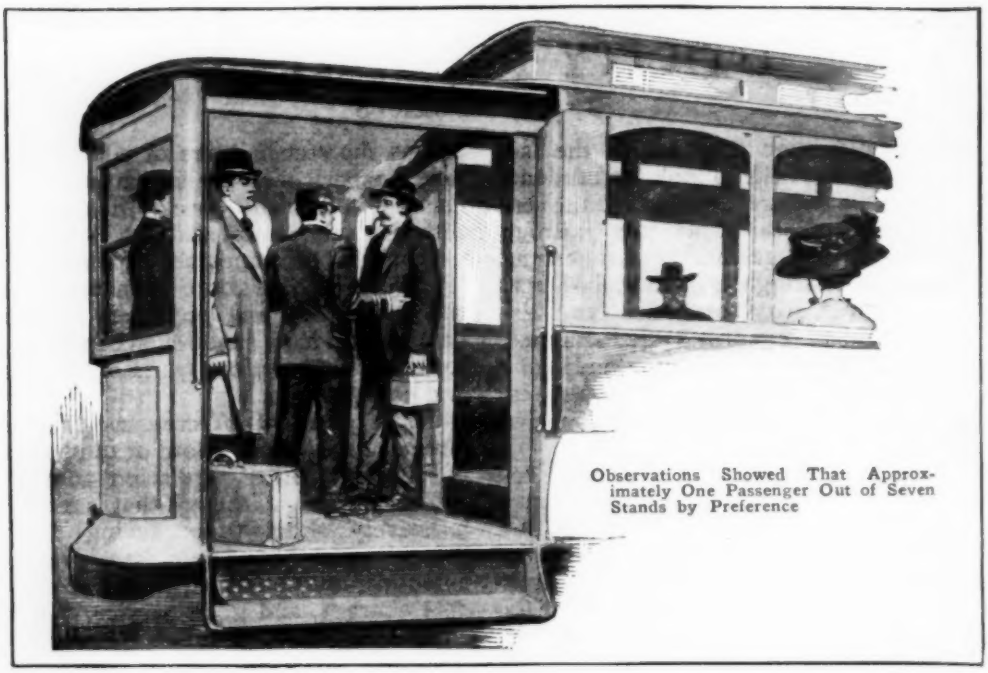
But in the engineering offices of the Railroad Commission of Wisconsin they take the doings of humanity, reduce them to columns of figures, transpose them onto charts, and apply them with unerring accuracy to the work of regulating public utilities. The commission is unique. It accomplishes things. The people of the state have confidence in it. They feel that their interests are in safe hands. And the corporations, realizing the ability and fairness with which it regulates, respect it, and, with few exceptions, have adopted its suggestions without protest.

To the small corporations, the minor public lighting, street railway, and telephone companies, it stands in the position of a watchful big brother. For it must be remembered that all public utility corporations are not giant aggregations of wealth, possessed of means to engage high-priced engineers and lawyers. Throughout every state there are scores of small public utility companies the stockholders of which have never experienced the sensation of receiving a dividend check. Their condition is only too often due to the inexperience or incompetence of managers or employes. In more than one case the inspectors and engineers of the commission have saved such companies from self-destruction by timely advice and co-operation.

Three years of effective work have demonstrated the wisdom of the policy of public utilities regulation adopted by Wisconsin. Although that is a comparatively short time, during those three years the system has worked smoothly and produced order, reasonable charges, and good service, where before there was confusion, discrimination, extortion and profanity-provoking service.

The same technical staff which serves the Railroad Commission also serves the State Tax Commission in the valuation of steam and electric railway properties, and the electric lighting and power plants which are associated with some of the electric railways. The method of determining the valuations has been reduced to an exactness which permits of few disputes between the commission and the companies. Uniform accounting methods have displaced the slipshod individual systems which baffled the most expert state accountants in attempts to learn the financial condition of corporations. A gas company, for instance, cannot claim that its pipe lines are worth $50,000, if the charts of the commission show that the cost of pipe and labor 10 years ago, when the lines were laid, make it evident that the work could have been done for half that amount.

The chief engineer and many of his assistants are members of the faculty of the University of Wisconsin, professors and instructors in the engineering departments. It is the way these



Observations Showed That Approximately One Passenger Out of Seven Stands by Preference

engineers, these men of facts and figures and immutable physical laws, have applied the human factor in this work of regulating public utilities, that makes the Wisconsin commission unique. By thousands of observations, made under normal conditions of service they have discovered, for instance, that telephone service is poorer on a dismal, cloudy day than on a fair day because of the effect which the weather has on the mental condition of the telephone girl; that badly ventilated offices affect telephone service for the same reason; that a certain percentage of persons using street cars are strap-hangers by preference, and that there is a great difference in the quickness with which people of different large cities board cars. An Indianapolis man will board a car in 1.02 seconds, but it takes the average Milwaukee man 1.5 seconds to clamber aboard. Through thousands of observations these results showed that for some inexplicable reason Milwaukee people are slow in boarding cars.

One of the most elaborate single investigations yet undertaken by the commission's engineers was in connection with a street railway fare case and complaint on service coming from the city of Milwaukee. This investigation covered the street railway service then being given by the Milwaukee Electric Railway and Light Company, the service needed by the people and the changes in schedules and routing of cars necessary to give the kind of service needed.

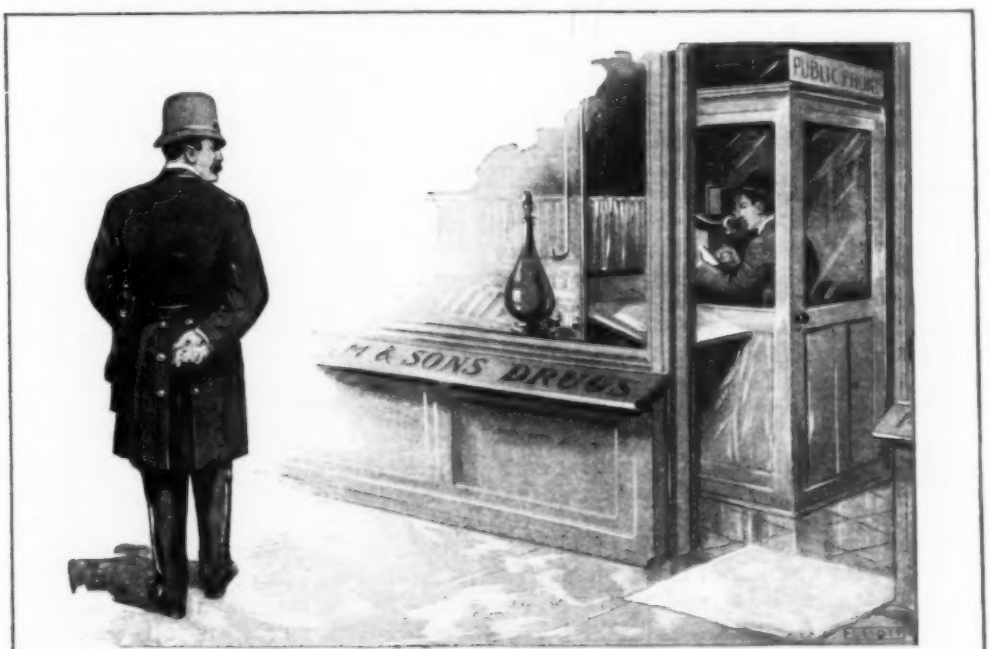
In order that the investigations might disclose the real conditions then existing and the real character of the service being rendered by the street railway company no information whatever was given out concerning the commission's plans and proceedings in these matters. The work was begun in secret and carried on for several weeks without the knowledge of either the company or any of the city authorities.

The first step was the study of the traffic as a whole. It soon became obvious that the heaviest traffic or greatest travel occurred between 6:00 and 9:00 a. m., 11:00 a. m. and 2:00 p. m., 5:00 and 8:00 p. m., and 10:00 to

11:00 p. m. The observations were then confined largely to those periods as there appeared to be no reason why any scheme for handling the traffic during those periods would not prove entirely adequate during other parts of the day.

The 14 main lines of the street railway system were then investigated in much detail for each of the different periods of heavy travel. Inspectors collected data as to the number of passengers riding, the number of cars, their times of arrival, and such other facts as would be of value in dealing with the traffic conditions. For a number of days the traffic would be studied closely on one line only, but at several points, in order to determine the average number of passengers riding on that line at those points, the amount of overcrowding if any, the origin and destination of passengers, the number standing by preference (as shown by the existence of vacant seats) and other matters of a similar nature which would thoroughly familiarize the inspectors with the various traffic conditions. Observations on about nine thousand cars showed that quite a number of the people riding really preferred to stand even when seats were available, and this tendency was so pronounced that it seemed to follow a fixed law.

In fact, observations showed that in 1,499 cars an average of two people stood by preference when only 10 to 14 people were on the car. In 1,483 cars observed, three people stood when there were only 15 to 19 passengers. In 1,411 cars observed, four people stood out of 20 to 24 riding. In 392 cases, in which there were from 40 to 42 passengers on the car, eight of these stood by preference. Therefore, for a car having a seating capacity of 42 people (the size of the street car in general use in Milwaukee), a "comfortable load" was taken as 50 passengers, on the assumption that if eight people preferred to stand, even if seats were provided for them, it was therefore unnecessary to provide seats for these eight people. A car which afforded seats for 42 people could then be called



Inspectors Making Secret Telephone Tests Were Regarded as Suspicious Characters

He Often Fails to Appreciate the Difficulties of the Operator and Adds to Her Troubles by Losing His Temper

upon to carry a load of 50 people "comfortably" under these conditions. A number of reasons might be suggested as explaining this preference of a number of passengers to stand rather than to sit down in available seats. The passengers may wish to stand on the rear platform and smoke, they may prefer to stand on the front platform for observation, or they may have been sitting down all day and prefer to stand for that reason, or, having only a short distance to ride, they may not care to go to even the slight trouble of selecting one of a number of available seats. In fact, there is a wide variety of reasons why a number of the passengers should prefer to stand rather than avail themselves of seats, and this tendency, as shown above, seems to obey a general law which is graphically illustrated in the accompanying diagram.

Another point covered in the investigation was the movement of passengers in alighting from and boarding cars. It was noted that passengers in Milwaukee were slow in alighting from and boarding cars as compared with the average passenger in other cities. From observations made in St. Louis, St. Paul, Minneapolis, Duluth and Indianapolis, as well as Milwaukee, it was determined that during the evening peak in the down-town districts of these cities, it required an average of 1½ seconds per passenger in Milwaukee to board a car when 10 passengers were getting on. This is contrasted with 1.37 seconds in Duluth and St. Louis (pay-as-you-enter), 1.25 seconds in Minneapolis, 1.20 seconds in St. Louis and St. Paul, and 1.02 seconds in Indianapolis. When five people boarded a car, the average in Milwaukee was also longer than that of any city.

At Indianapolis five people would board a car in an average of 1.25 seconds per passenger, while at Milwaukee 2.12 seconds were required. And even when 15 passengers were boarding a car, there was considerable difference in the time required by the average passenger between Milwaukee and the other cities investigated. As a matter of fact, the best time made at Milwaukee was approximately 1.20 seconds per passenger, no matter how large the crowd, while the other cities attained an average of approximately 0.8 seconds per passenger when from 15 to 20 people or more boarded the car. In a general way, this same feature was noted in the movement of passengers when leaving cars, in all the cities mentioned.

At the first glance it would appear that this slowness was due entirely to

the passengers themselves, but upon investigation it was ascertained that the company was partly to blame, due to their having no definite established stopping-places for their cars. For instance, a car might stop exactly on the other side of the crossing, while the car following might stop a car-length or so past this point. The people would generally congregate at a certain place, expecting to board the car there and when the car proceeded 30 or 40 ft. past this point, it was necessary for them to walk or run to it. This caused a delay and thus required considerably more time in boarding the cars than would otherwise be the case. There were a few other minor points noted by which the movement of the passengers could be facilitated by action of the company, as well as by more co-operation on the part of the people themselves.

The Efficiency of Operators May Be Reduced by Heat and Humidity

The inspectors, working in secret to note normal conditions, not conditions when the companies were aware that their service was being tested, were on several occasions regarded as suspicious characters and taken in charge by policemen. One telephone inspector, securing data on the time of answering calls, would go into a public telephone booth, call a number at random, and hang up the receiver when the party on the other end answered, with the excuse that he had called the wrong number. He had been doing this in one town for two or three hours when the subscribers began to notify the police that a man had called their houses for the purpose of finding out if the occupants were at home, with the intention of robbing them if they were not. The inspector was rounded up by a policeman, and, his statements not being satisfactory, he was hustled away to headquarters. Here an audience with the chief was soon arranged, and to that official enough of the facts were given to satisfy him, and to obtain his assurance that the information given would go no further.

From six to eight members of the engineering staff have usually been engaged in the making of periodic inspections of gas and electric service in all parts of the state. The inspectors are equipped with calorimeters, pressure-recording gauges, recording voltmeters, etc., for testing the service, and other instruments for testing consumers' meters. These instruments are shipped by express from place to place, packed securely in special trunks or shipping-cases.

Inspections are made without notice to the utility managers, and, in fact, are usually begun without the knowledge of the men in charge of the plants.

The defect in gas service most likely to be noticed first by a consumer is inadequate pressure, and his complaint is usually "poor gas." Many of the first

recording pressure gauge charts obtained by the commission's inspectors showed ample ground for complaint from consumers as to pressure under which gas was supplied at certain times of the day.

By the use of an instrument termed a calorimeter, the inspector determines the heat value of gas. A few years ago nearly all gas sold was used for illumination, being burned in the old open-flame burners now so seldom seen. Today nearly all gas sold is used either in stoves, for heating or cooking, or is burned for illumination in a new type of burner which makes the heating power of the gas of more importance than the lighting power in the old-style open flame. In other words the standard of value of gas has changed from the "candlepower" to the "calorific" standard.

One of the commission's rules states that "a company furnishing gas which, within a one-mile radius from the distribution center, gives a monthly average total heating value of not less than 600 B.t.u. with a minimum which shall never fall below 550 B.t.u., may be considered as giving adequate service as far as the heating value of the gas is concerned."

Before the adoption of the new rules there were some companies supplying gas which had insufficient heating value, and in these cases the increase in such value required by law was one of the improvements brought about in the service.

The entire business of either a gas or electric plant in a small city is very often done by one man alone. Forty-five plants in Wisconsin had but one man each on their pay rolls, upon whom devolved the entire burden of operation, including firing of boilers or the regulation of water-wheels, the running of the machinery, and superintendence, meter reading, collections and bookkeeping—such of that as was done. It has been found that as a general thing very few records have been kept except such as were most essential.

It is natural that inspectors should have found deficiency in technical knowledge on the part of small plant operators. There are those who know nothing about taking care of their equipment, their distribution system, and meters. One operator cut down the speed of his generator and furnished 110-volt service instead of 220 volts, hoping thereby to save his

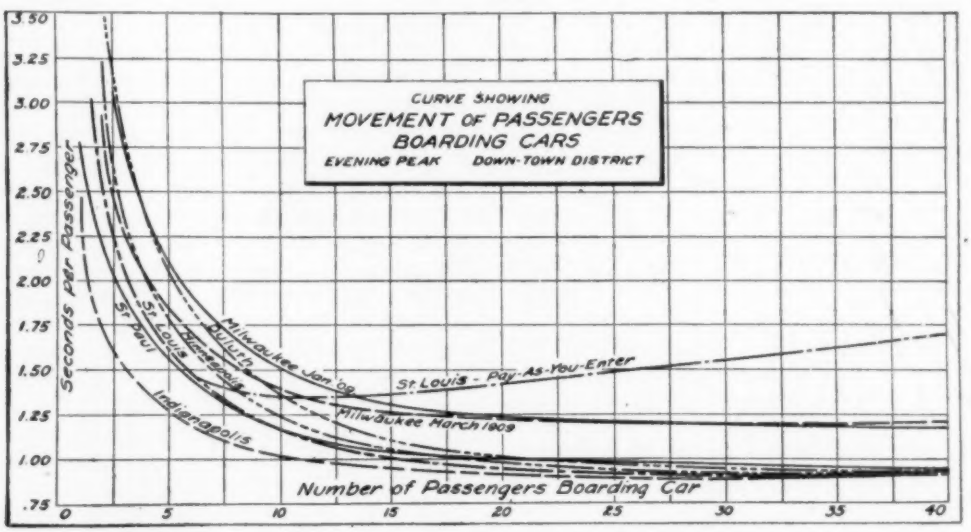
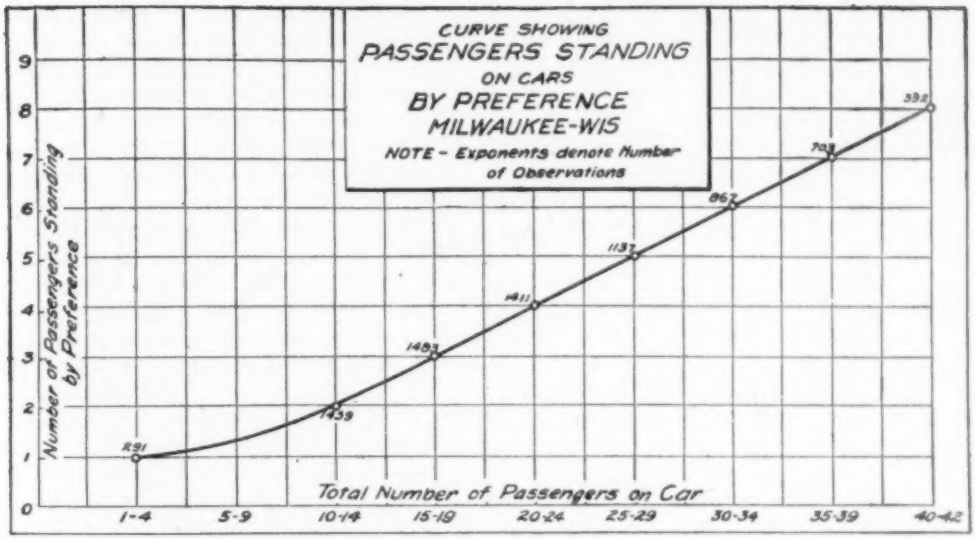


Chart Prepared by Wisconsin Railroad Commission Engineers Showing Relative Speeds of Street Car Users of Different Cities in Boarding—Lower Figures Show Number of Persons Boarding Car at Time of Observations



How the Wisconsin Railroad Commission Established the Fixed Law Which Shows That a Certain Number of Passengers Always Stand by Preference

water supply. One superintendent has been working on the principle that the greater the distance from the station the larger must be the wire, and consequently the wires of largest carrying capacities are employed in outlying extensions. Another operator, on having his attention called to the meter-testing requirements, said he had never been able to find anything about a meter which is adjustable and he could do nothing to a meter found to be fast or slow.

Finding conditions like the above, it is but natural that much of the inspectors' time has been taken up in giving information and instruction to plant operators, and it is believed that as a result of inspection of the smaller plants much has been done toward improvement of conditions.

Lack of profit in operation of small plants, and indeed of some of the larger ones as well, has been found to be due to lack of economies, such as use of feed-water heaters, proper firing of boilers, selection and weighing of coal, covering of steam pipes, repairing of leaks, setting of engine valves, etc. Savings can be effected by installing meters and preventing waste of current by consumers. Small, old-type transformers are responsible for large continuous losses, and it is noteworthy that comparatively little attention has been given to the transformer question. Many plants have a much larger transformer capacity than their generators will carry. Some of the small transformers are badly overloaded, while other large ones carry very little load. This is often due to the fact that no one has followed up these matters, the operator, with his various duties, forgetting that when a large increase or decrease takes place in any part of his system he should change transformers. Many of the systems are equipped with a large number of small transformers of old low-efficiency types, when a few larger transformers would take care of the load much more efficiently and give more uniform voltage.

The telephone exchanges in the 18 largest cities in the state were tested in October and November, 1909. All of these tests were made by the same inspector and therefore errors of "personal equation" were avoided. A double-handed, split-second stop watch was used in making the tests, and the time required to get responses from the exchange operator and from the

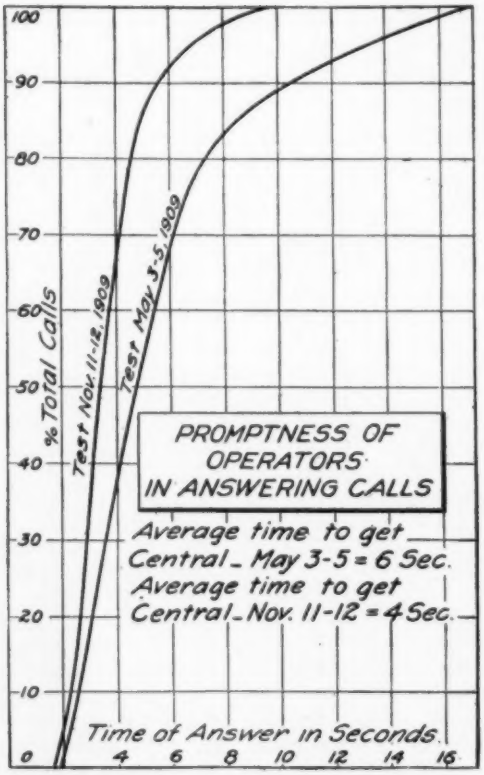


Chart Showing How Telephone Service Was Improved in Six Months—Figures on Left Show Number of Calls Made for Tests.

parties wanted was obtained quite accurately. Other features than promptness of response, especially by the exchange operator, were noted,—such as the percentage of errors in connecting the caller with the party called, the percentage of "busy" and "don't answer" reports and the amount of supervision or attention given to calls by the operator—that is, "central" asks, "Did you get them?" or informs you, "I'll ring again."

The data obtained in all the tests were carefully studied, compiled and compared. Wide differences in the character of service given by the various exchanges were clearly seen. The average time required to get a response from "central" was at least twice as long in some cases as in others.

In the case of one of the exchanges an earlier test had been made about six months before the series above mentioned, and a comparison of the results of the two tests on this exchange showed a very marked improvement in the service given. Subsequent tests on the other plants made by gas and electric service inspectors as a side line of their work have indicated decided improvements in telephone service in many places, and this is clearly the result of the efforts of the commission and the stimulating effect of the knowledge on the part of telephone managers and operators that the service they are giving is being studied by the commission and compared with that given in other cities of the state.

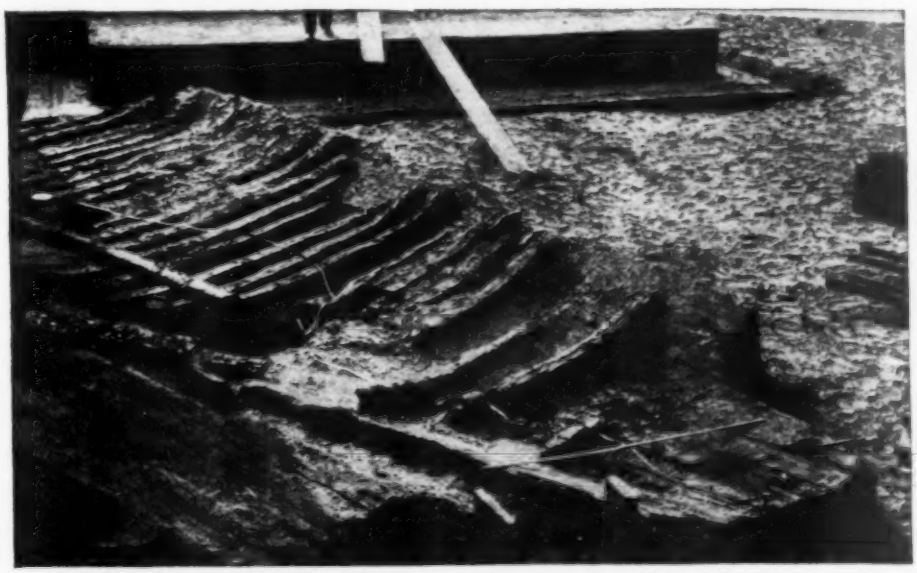
The accompanying diagram is a representation of the results obtained in the two tests, six months apart, on the same exchange. The chart, or diagram, shows that in the May test the length of time required to get an answer from "central" sometimes ran up to 17 seconds, while in November the operator always responded within 10 seconds; 90 per cent of the calls required about 5½ seconds to "get central" in the second test and about 10½ seconds in the first test, and so on.

It was found that the best measure of good service was the quickness of response of operators, although it is easy to gain speed at the expense of accuracy and a large number of wrong connections may be the result.

There are many causes for variations in character of service either between that of different exchanges or between that of the same exchange at different times, many of which are unavoidable, and others may be eliminated. Some which are perhaps not generally appreciated are the extent to which calls may be bunched, or the number of calls going in at the same time, or the amount of the operator's time one caller may take up either necessarily or otherwise, attempts being often made to get a conversation going with "central." The efficiency of operators may be greatly reduced at times by intense heat and humidity, a girl being near the point of collapse under conditions not appreciated by a caller sitting back in an easy chair and in the com-

fortable breeze from an electric fan, and who even under his more pleasant and comfortable conditions loses patience and gives expression through the phone to his annoyance, thus adding to the operator's difficulty in rendering service to him and to others.

A very remarkable fact in connection with the public utility work being carried on in Wisconsin is that the utilities people have in general so heartily responded to suggestions of the commission and its assistants and that the policy of the latter has been to co-operate and assist in the solution of the matters in the hands of the former in the manner that will be for the best interests of all concerned.



Skeleton of Ancient Ship Unearthed in London

REMAINS OF ROMAN CRAFT FOUND IN LONDON

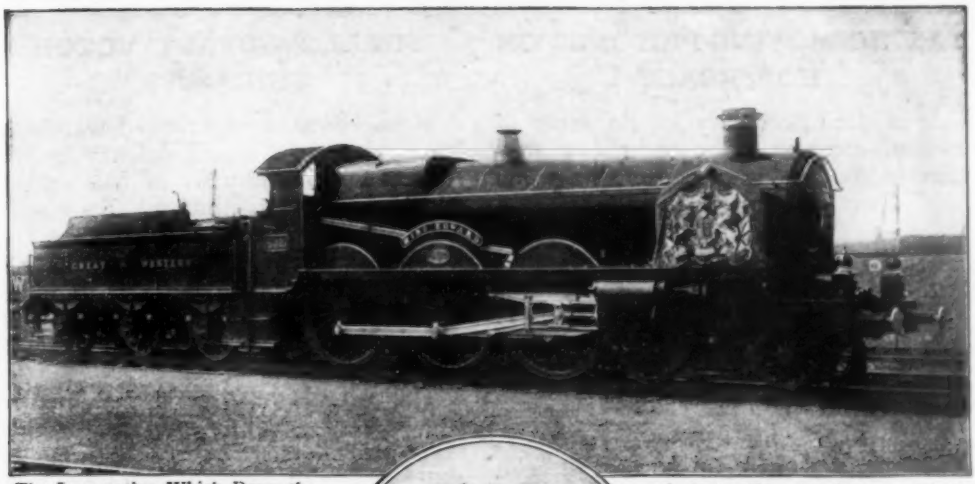
In excavating for the foundations of the new County Hall in London the workmen discovered the remains of a long oak barge, pressed flat by the weight of Thames mud above it. It is believed to have been one of the war barges in which the Romans invaded England. It was cunningly contrived with a stout keel, about 50 ft. long, side ribs set 12 in. apart, and an inside beam measurement of 16 to 18 ft. It was clinker-built, with 2-in. flanking boards. Not one piece of metal went into its making, everything being held together by neatly-rounded dowel-pins. All the material was fine oak.

So rotten were the black timbers found that preservation was decided to be almost out of question. The ribs, again bare to the sky after centuries, were soft to the touch, and probably the only preservation of it will be in the photographs, one of which is shown in the accompanying illustration.

¶Sawdust is being utilized in Germany for the manufacture of cheap blotting paper.

THE FUNERAL OF KING EDWARD

THE ceremonies attending the funeral of the late King Edward marked it as one of the most impressive events of the kind in history. Reigning monarchs of nine countries participated, and almost every section of the earth was represented in the sorrowing throng that followed the body of the king through the streets of London. The above illustration showing the gun carriage bearing the body of the king in the foreground, gives an excellent idea of the manner in which thousands of people crowded into London to view the funeral procession.



The Locomotive Which Drew the Funeral Train to Windsor

And the Gun Carriage on Which the Body was Carried

Mirrors Used by Sightseers Viewing the Funeral Procession of the Late King from Behind the Crowd—Glasses Fixed to a Bamboo Pole and to an Umbrella—Police Strung Barbed Wire on Trees to Prevent Boys from Climbing into Them, but These Wires Were Cut

TAKING MOVING-PICTURES ON HORSEBACK

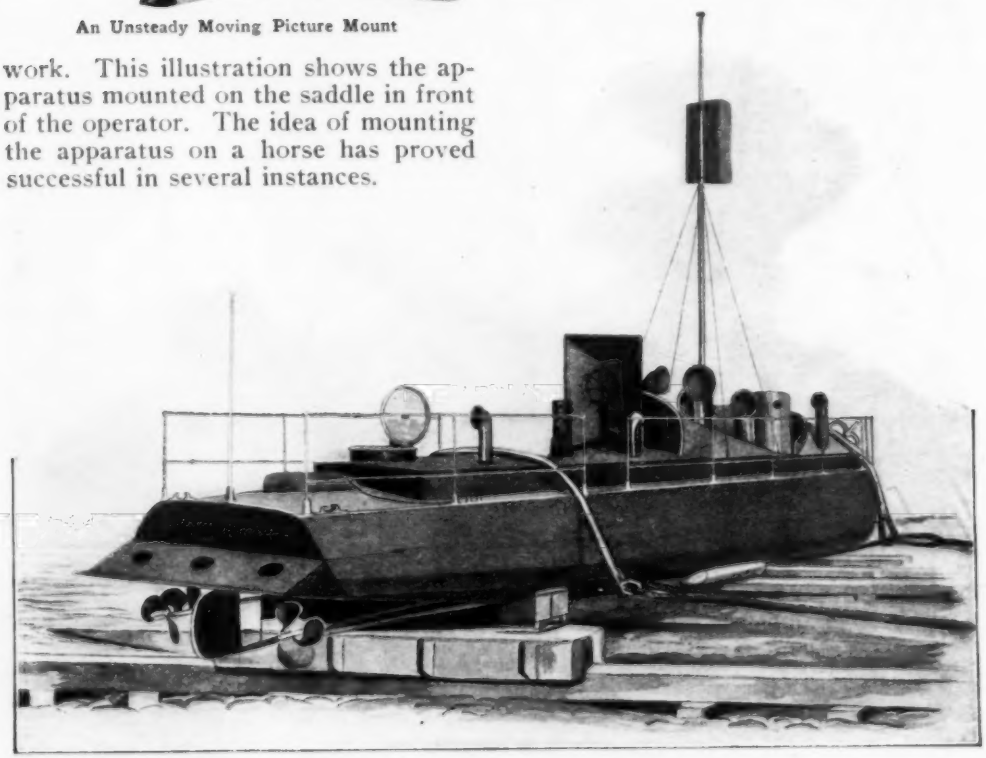
It is often necessary for the taker of moving-pictures to be himself in motion while he is accomplishing his work. This illustration shows the apparatus mounted on the saddle in front of the operator. The idea of mounting the apparatus on a horse has proved successful in several instances.

An Unsteady Moving Picture Mount

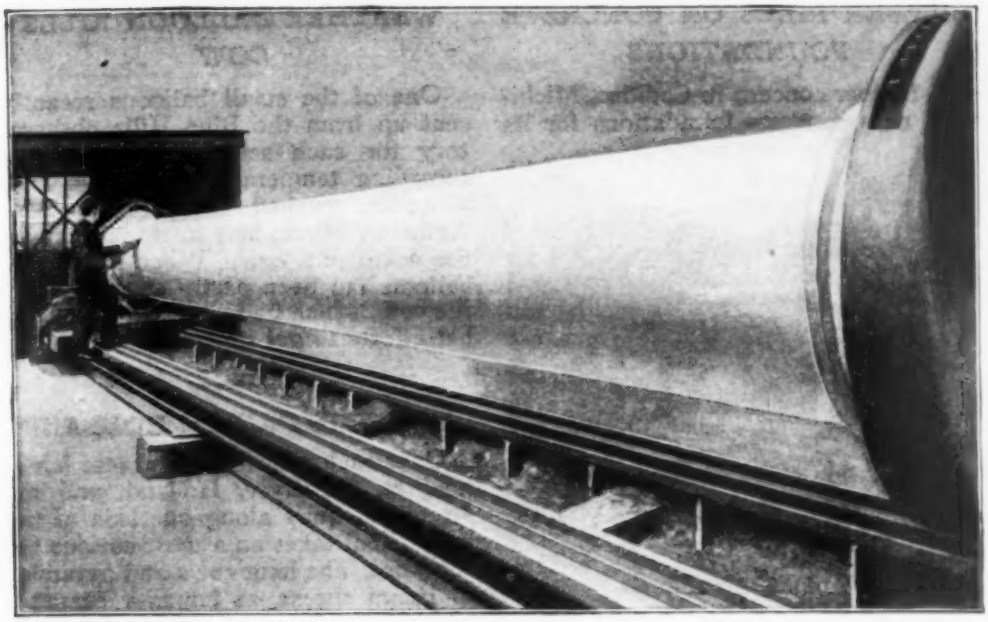
SHALLOW-DRAFT MOTOR GUNBOATS

Motorboats as vehicles of war have been raised to a high efficiency by the Austrian government in the shape shown in this illustration. Four such gunboats are now in operation on the Danube. They are of very shallow draft, and the speed of about 25 miles an hour is made more by sliding over the surface of the water than plowing through it.

The propulsion force is contained in five sets of gasoline engines, driving three propellers. The middle propeller shaft is driven by one set of engines, and each of the wing shafts by two sets. The curious extension stern arrangement by which the burying tendency of the propellers is offset is clearly shown. Were it not for this arrangement the stern would become completely submerged and drag badly with the propellers working at full speed.



Stern View of the Austrian Motor Gunboat



Courtesy Monumental News

At Work on a Huge Marble Column

Other features of exceptional interest are the shield that protects the officer in command from an enemy ahead, and the armored cage or crow's nest on the mast, from which an excellent lookout can be kept over the banks of the river.

The length of the fighting motorboats is 60 ft., with a beam of 9 ft. The hull is of steel, made exceptionally strong forward to withstand the shock of water when running at high speed. The machinery compartments, gasoline tank, gun turret amidships, and conning tower are protected by bullet-proof plating. The hull is divided by transverse bulkheads into five watertight compartments. The gasoline tank is distinct from the hull, so that in the event of its being damaged, the fuel runs overboard and not into the hull.

TURNING HUGE MARBLE MONOLITHS

In carrying out the contract for the exterior marble for the Curtis building in Philadelphia a Vermont marble company had to provide 14 huge marble columns, monoliths, 30 ft. long, 3 ft. 1 in. at the top, 3 ft. 8 in. at the bottom, and weighing about 33 tons each. These marble columns, which are probably the largest ever turned out in America, required a turning lathe of enormous capacity.

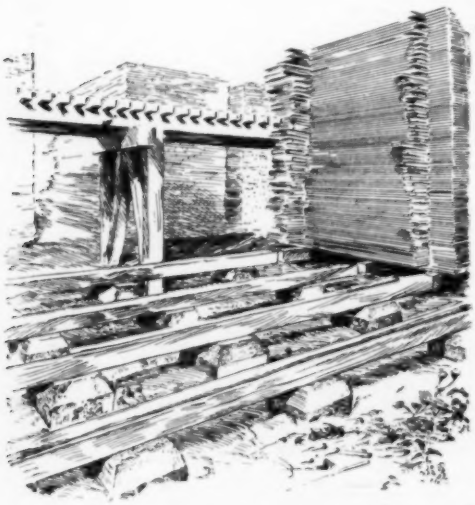
The blocks, as taken from the quarries, weighed from 45 to 50 tons each and were 32 ft. long. An electric crane of 50-ton capacity lifted them from flat-cars and lowered them into the lathe, where they were fastened at each end into square steel frames of the proper size, which passed over the end of the marble and were made secure by set screws.

AUTOS DRIVE TRAINS OUT OF BUSINESS

There is a town in South Africa, according to "African Engineering," where trains have ceased to run, owing to the progress of the automobile. Not only this, but, incisive irony, the station there has been converted into a garage for the housing of the victorious machines. The ticket office, waiting rooms, and other offices are now used as workshops and storerooms.

LUMBER PILES ON CONCRETE FOUNDATIONS

A lumber concern in Cadillac, Michigan, uses concrete foundations for its



Concrete Foundation for Lumber Piles

lumber piles and finds them very stable and economical. The foundations are made of 4 parts bank gravel and 1 part cement, and are 16 by 16 in. at the bottom, tapering to 12 by 12 in. at the top.

WEATHER BALLOON KILLS COW

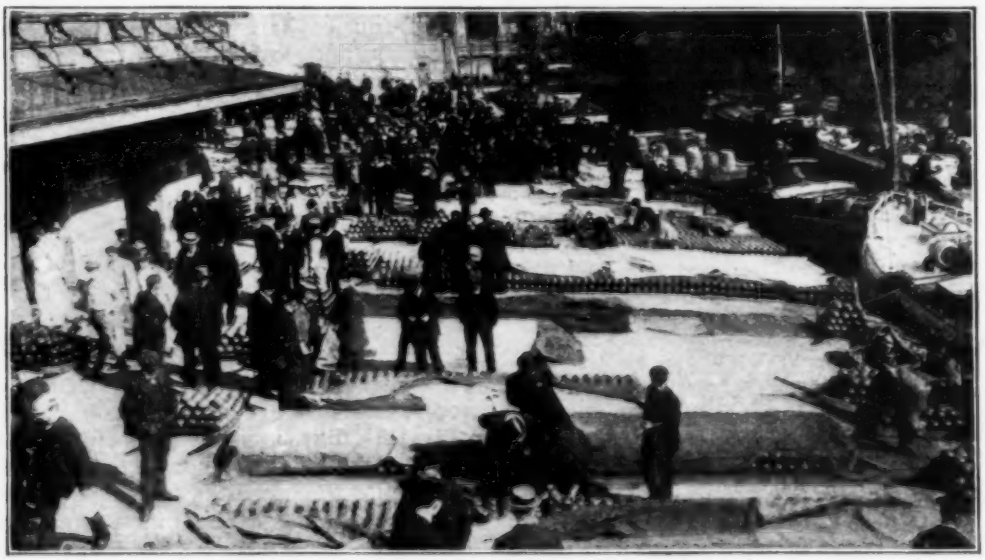
One of the small balloons recently sent up from the Blue Hills observatory for such scientific purposes as recording temperatures, etc., at high altitudes, reached ground again near Amherst, Mass., and forthwith caused the death of a cow. When found, the balloon had been partly swallowed by the cow, which had choked to death in her efforts to get it down.

A CHEESE FAIR IN HOLLAND

Once each year a great cheese fair is held at Alkmayer, Holland, and the stretch of quay along one side of the main canal takes on a most curious appearance. The long rows and pyramids of Edam cheese, as far as appearance goes, might be taken for a huge supply of cannon balls.

The Dutch cheese fair is a very important exhibition in Holland, as agents attend it from all parts of the world to make purchases for a year's supply.

Edam cheese is probably the greatest dairy product of the Dutch country and finds its way everywhere.



Edam Cheese—Not Cannon Balls

HOW TO MAKE A MISSION SETTEE

The mission settee shown in the accompanying picture should be made of quarter-sawed white oak. The material needed will be as follows:

4 posts, 3¼ by 3¼ by 36½ in., S-4-S.
4 end rails, 1½ by 5 by 32 in., S-4-S.
12 end slats, ⅝ by 3½ by 24 in., S-4-S.
1 front rail, 1½ by 7 by 87 in., S-4-S.
1 lower back rail, 1½ by 9 by 87 in., S-4-S.
1 upper back rail, 1½ by 12 by 87 in., S-4-S.
2 cleats for seat frame, 1½ by 2 by 82 in., S-4-S.
2 cleats for seat frame, 1½ by 2 by 32 in., S-4-S.

On account of the unusual width of the pieces that go into the makeup of this settee, it will be necessary to have the wood thoroughly seasoned before putting them together, otherwise shrinkage will cause them to crack open.

Mission Settee Complete

Begin work by making the ends of the settee first. Cut the posts to length, chamfering both top and bottoms somewhat so that they shall not splinter or cause injury to the hands. Next lay out and cut the mortises as shown on the drawing. With the posts finished, lay out the end rails, cutting the tenons and the mortises into which the ends of the slats are to be fitted.

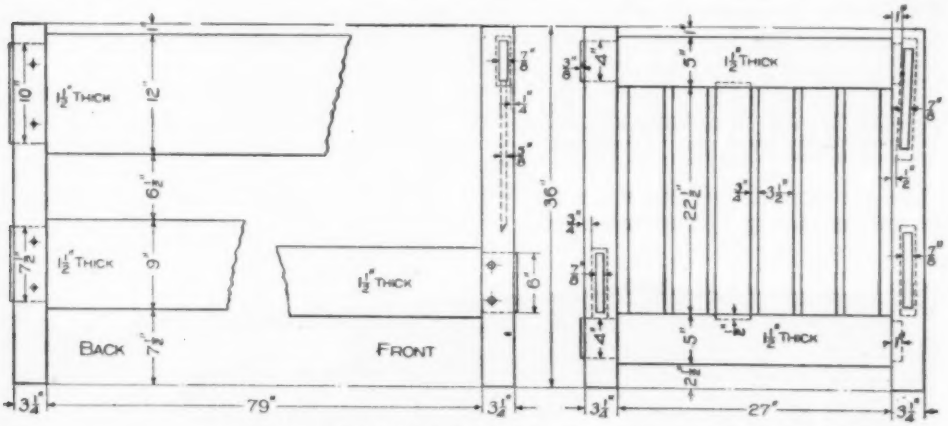
It should be noted that the drawing calls for the "setting in" of the whole of the ends of the slats, there being no shoulders. This is much easier and gives just as satisfactory a result, provided the sides of the mortises are carefully cut.

Thoroughly scrape and sandpaper all these parts and then put the ends together. In addition to the glue it will be well to through pin each of the tenons and mortises. These pins may be put in flush and permanent on the ends of the settee. On the side rails, however, the pins are to be allowed to project so that they can be removed, and no glue is used in the joint.

While the glue of the ends is hardening, prepare the rails of front and back. Scrape and sandpaper these and when the clamps can be removed from the ends put the whole frame together. The ends of all projecting tenons are chamfered.

The illustration shows a loose leather cushion. There is quite a variety of materials out of which such a cushion can be made. The best, of course, is leather. In the highest class of fur-

niture where loose cushions are used, the seat base is formed by solidly mortising a frame together on which is woven a heavy cane seating. This in turn is fastened to the inside of the piece of furniture, and the cushions when placed upon it make a very comfortable seat. The stock bill for this settee calls for such a frame. Wood slats may be substituted if desired.

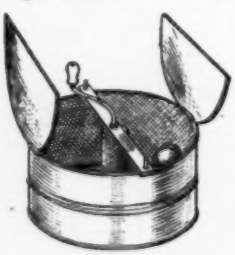


Details of Settee Construction

This piece of furniture will look well if finished in weathered oak. See that all glue is removed from the surface, and that the wood is clean and smooth, and apply a coat of weathered oak oil stain. Sandpaper this lightly with No. 00 paper when the stain has thoroughly dried, and put on a coat of lackluster or an equivalent.

NOVEL POTATO PEELER

A unique potato peeling and washing machine is shown in the accompanying sketch. The lid is shut down when the machine is in operation so that the water will not splash out. The revolving bottom is provided with projections on the outside edge, which turn the potatoes over so as to give every part of the surface equal treatment. Sharp cutting edges around the sides pare the potatoes as they are pushed around by the revolving bottom. In operation the machine is filled with water so that when the potatoes come out they are perfectly clean.



"RESINITE" TO REPLACE CELLULOID AND IVORY

Various art industries in Germany have found a number of uses for a newly invented substance called "resinite." It is produced in a variety of modifications by the union of formaldehyde and carbonic acid in connection with certain metallic salts. The name it bears, states Thomas H. Norton, U. S. consul at Chemnitz, was given it because of its resemblance in an important form to ordinary resin. This special variety is used chiefly with porous materials, such as wood, paper, and pasteboard, and renders them hard and impermeable. Ordinary pine wood, when thoroughly impregnated, becomes so hard that it rapidly dulls a planer.

In another form, resinite can be poured as a liquid into molds. After hardening, it is transparent, with a ruby tint, infusible, and unaffected by ordinary chemical reagents. It is well adapted for making ornaments such as hatpin heads, imitation jewelry, and for most purposes where enamel or enamel

varnish is employed. For doorplates, street numbers, and signs, it is said to be an excellent material, being entirely unaffected by atmospheric action.

Resinite in its third modification is liquid, but upon the addition of a mineral acid it solidifies in a few minutes to an elastic substance which can be easily cut, turned, and polished. In this form it can replace horn, celluloid, vegetable ivory, and similar substances used for buttons, knife handles and mosaic designs.

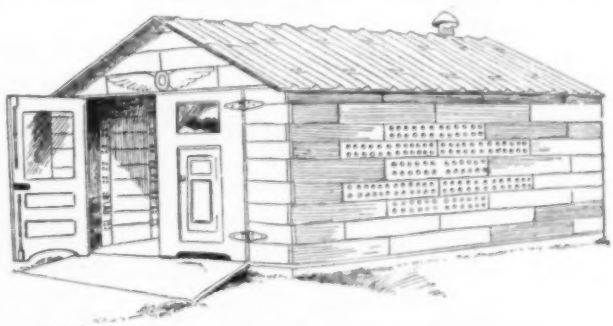
FIRE CAUSED BY FIRE EXTINGUISHER

One of the most extraordinary causes of fire ever recorded has to do with the destruction of the warehouse of a match company in St. Louis, in which a sprinkler tank, provided as a means to extinguish fires, was the means by which the blaze was started.

The tank supports collapsed, and the falling tank ignited the matches, with a resultant loss of $80,000. The supporting structure of the tank, according to the fire reports, had been allowed to rust until the diameter of the steel at places was only $\frac{3}{32}$ instead of $\frac{5}{16}$-in.

PORTABLE CONCRETE GARAGE

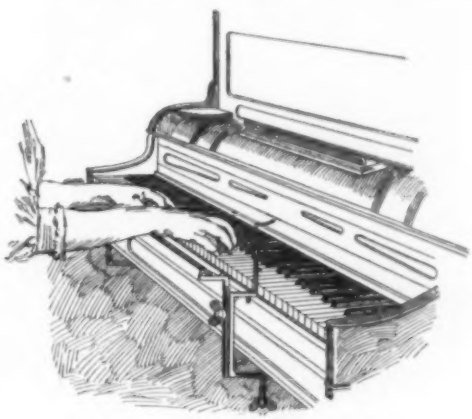
The portable concrete garage is the latest solution of the problem of housing automobiles where the owner wishes to take care of his own machine, and does not care to erect a permanent garage of his own. The walls of this garage are reinforced concrete slabs made in sizes of 5 ft. by 1 ft., and 2½ ft. by 1 ft., both sizes being 1½ in. thick. The frames are of steel, and the concrete slabs are bolted to the framework with screws, the only tool required in the erection being a monkey-wrench. The sides of the garage are made rainproof by use of tongue and groove joints on the concrete slabs, which fit close together so that no mortar is required. The roof is made of copper carried on steel T-bars, and the doors are either wood or metal. A peculiar feature of these garages is that the walls are without windows, light entering through three-inch circular lenses.



Monkey Wrench Only Tool Used in Construction

WRIST-GUARD FOR PIANO PRACTICE

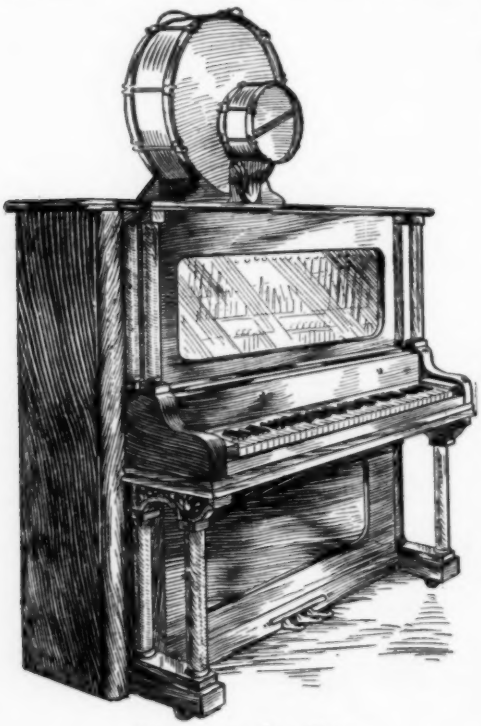
The device attached to the keyboard of this piano is designed to teach the young pianist the proper position of the hands in playing. If the wrists are allowed to fall they touch the wire stretched on a line with the keyboard, which gives way automatically. If the wrists do not touch the wire the pianist is assured that the hands are in the proper position.



Teaches Proper Position of the Hands

AN AUTOMATIC ORCHESTRA

The moving picture theater with its peculiar requirements has inspired the



Orchestra in One Piece

designing of an instrument which is a combination of a piano, a metalophone, a bass drum and a snare drum. It is constructed on very much the same principles as the ordinary automatic player. The proper pedals are automatically operated for soft and loud effects, and the drums can be regulated to any degree of softness, or can be detached for certain pieces.

FLOOD DAMAGES IN MISSOURI

A little over a year ago the state bureau of labor of Missouri began to compile statistics showing the financial loss in that state from floods. To secure reliable results blanks were sent to conservative men in the various counties of the state where floods occurred during July, 1909. The results of this special investigation in the 43 counties above the Missouri river and the 10 counties bordering on the south side of the river are startling. In that month more than 1,485,290 acres of land were overflowed, while the crops destroyed were worth $18,896,340.

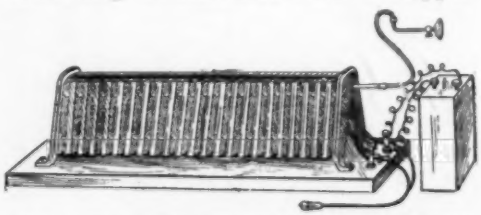
The loss in the Missouri river bottom for the year 1909 was not as heavy as in 1908, because many farmers were able to thresh and haul their wheat from the lowlands before the floods occurred, while the 1908 overflow occurred just before the wheat harvest.

Should three heavy overflows occur every 10 years, and this is said to be a conservative estimate of the number of such floods, the loss in 37 years, which is an average lifetime, would be more than $100,000,000. The idea in gathering the above figures was to show the advisability of spending money to construct new channels and build levees.

BATTERY TAKES ELECTRICITY DIRECT FROM HEAT

Some time ago this magazine described an apparatus by which an American had successfully generated sufficient electric current direct from the rays of the sun to operate his small workshop. The curious heat battery here illustrated works on the same principle, except that the heat is obtained from a gas flame instead of the sun.

This battery has 50 "thermo couples," consisting of alternate bars of copper



This Battery Makes Electricity by Being Heated

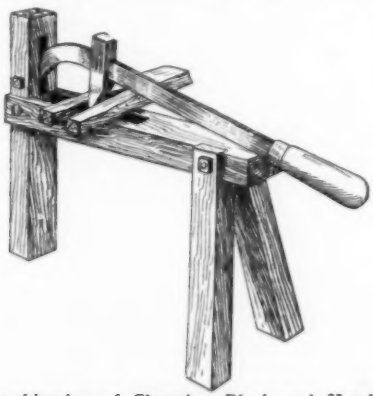
and bismuth-antimony alloy. Upon each junction is a tiny gas jet, the supply of gas being obtained from an ordinary gas fixture. As soon as the metal-

lic junctions heat up, which takes only a few seconds, a current is generated at about 4 volts pressure, and the output is from two to four amperes. This is only sufficient to allow the charging of one 2-volt cell at a time, but demonstrates what may be possible in the future with a larger heat battery for the charging of cells for automobile lighting and ignition.

The production of electricity direct from heat in sufficient quantities to be commercially practical has been a dream of scientists for many years. The principle of the thermo-pile battery is that, if the junction of two pieces of dissimilar metal be heated, a very feeble current is produced, but by multiplying the number of these junctions, a current of appreciable strength can be obtained.

A NOVEL WOOD CHOPPER

A contrivance which will be welcomed by many small boys who dislike to chop wood, has been brought out by an English firm. This combination of hatchet and chopping block is mounted on a strong wooden bench. A long iron arm, on which is affixed a sharp pointed steel blade, works as a lever. The steel blade is 1 in. in width, and splits rather than chops the wood. The



Combination of Chopping Block and Hatchet

leverage obtained enables the chisel head to drive quickly through the toughest wood. The machine, too, obviates the danger of chopping the fingers instead of the wood.

MECHANICAL STEED FOR TRAINING CAVALRYMEN

The rocking-horse brigade has become a reality in the English army, for

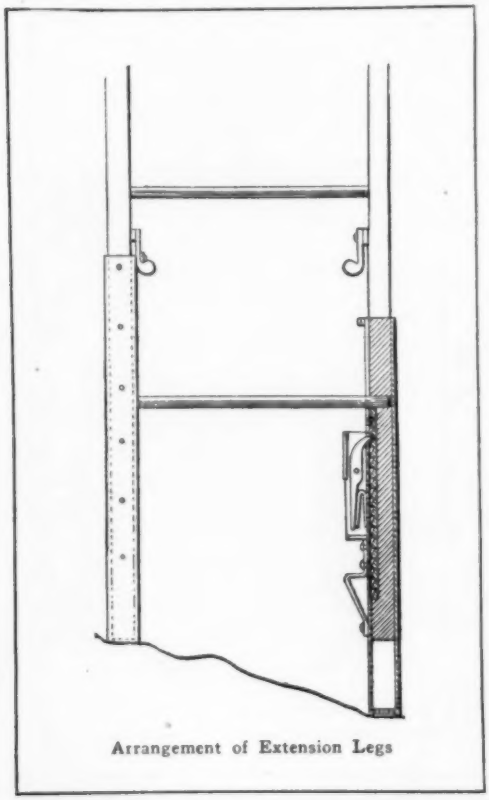
English Cavalryman Astride "Back Ache"

the embryo cavalryman may now take his first lessons in riding on a docile, mechanical steed. The rocking-horse is said to provide most of the sensations experienced when riding a flesh and blood horse. At any rate the novice in the art of managing a horse gets all the advantages that are necessary to his preliminary training and none of the dangers. The horse's head is hinged and is said to be so cunningly fitted with springs that its rider soon learns how to feel its mouth. Furthermore, it is guaranteed to stand still while being harnessed. The horse is called "Back Ache."

¶Preparations are being made by the Insular Government to install a complete wireless service throughout the Philippine islands.

FIRE LADDER WITH EXTENSION LEGS

The necessity of often having to raise a fire ladder upon uneven or sloping ground has resulted in the invention shown in this illustration. The base of the ladder has extension legs, which may be lowered or raised to conform with the ground conditions. The extensions are really sleeves sliding over the legs proper. When one of the sleeves is to be extended, the operator places a foot on the bracket the sleeve is provided with, and depresses it until the sleeve base touches the supporting surface. On the inside of the leg proper is a ratchet rack, provided with 16 teeth. As the sleeve is pushed downward a pawl slips over these teeth, any one of which it will solidly engage with when the base of the sleeve meets a supporting surface.



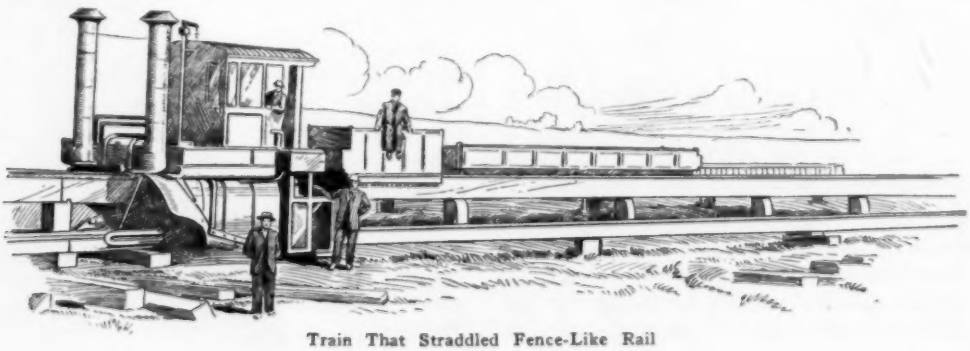
Arrangement of Extension Legs

TONS OF DYNAMITE EXPLODE AND SHAKE TOWN

Three lighters in the Harbor of Kobe, Japan, loaded with dynamite, were sunk by the explosion of one of them, and scarcely a house in Kobe escaped some damage. One of the lighters, carrying 130 tons of the explosive, caught fire, and the resultant explosion and upheaval caused the other two lighters to sink without exploding their loads. The fire burned a sufficient time to allow nearby steamers to reach a safe distance before the explosion occurred.

OLD-TIME MONORAIL STRADDLED BY TRAIN

The recent success with the English and German gyroscopic monorail systems has drawn attention to a curious railroad operated for the transportation of passengers and freight between Stratford and Gilmour, Pa., about 1878. It was a sort of monorail road, but the train was kept on the rail by straddling



Train That Straddled Fence-Like Rail

it as a boy straddles a fence. On each side of this single rail, and lower down, was a guide rail, which served to keep the train balanced, while the fence-like rail supported its weight.

This extraordinary road did a profitable business until the boiler of the engine blew up, killing six people. After the accident the road was abandoned.

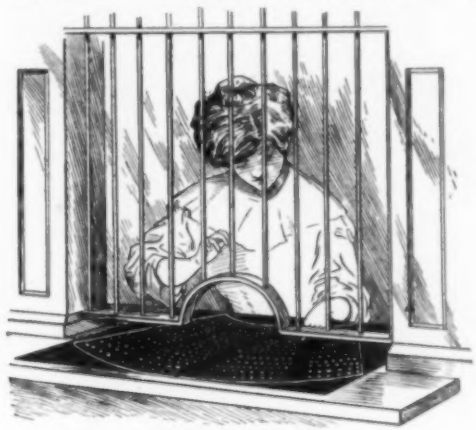
TELEPHONE SET USED IN U. S. NAVY

The necessity of a telephone set that will admit of issuing orders to gun crews while the guns are in action has resulted in the compact mechanism here illustrated. The two chief requirements were the deadening of outside sound so that the orders could be clearly heard, and the perfect freedom of the hands, both of which this set meets.

It consists of a combination of steel bands, provided with suitable adjusting facilities, on which two receivers and a transmitter are mounted. Two receivers are used so that all outside noise will be cut off from both ears. They are suspended by a ball and socket arrangement which allows them to fit tightly against the head. The outside noise is deadened by felt. The transmitter is so arranged that it can be adjusted to come directly in front of the mouth.

SEAT-SIGNAL SYSTEM FOR THEATERS

This system makes it possible for the ticket-seller of a theater to know just which seats are in use and which vacant. Each seat is represented by a tiny electric light on a plan of the theater under the glass top of the selling counter. The lamp representing each seat burns as long as the seat is vacant, and an electrical contact on the



Unoccupied Seats Designated by Electric Lamps

seat extinguishes the lamp when it is occupied.

According to the inventor, the ticket seller may display an "all seats occupied" sign when every lamp is dark, and may sell additional admission tickets whenever any lamp is again glowing, indicating that patrons have left their seats.

WELDLESS CHAIN FROM CRUCIFORM BARS

The means by which weldless chains are made by a British concern is clearly explained by this illustration, which shows the transition of a cruciform steel bar into links. The length of each chain is in proportion to the width of the cruciform bar. When longer chains are needed than it is possible to make

The Stages of a Weldless Chain

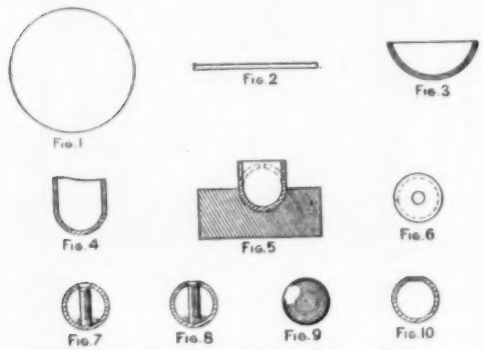
from one bar, a connecting link, made of the finest quality of welding steel, is used.

The weldless chains are said to be very light in proportion to their strength.

¶Canada produced 3,111,249 lb. of arsenic during the past year.

METHOD OF MAKING HOLLOW METAL BALLS

The accompanying sketches show the different stages in a new method of making hollow metal balls which was



Stages in Making Hollow Metal Balls

patented recently. A disk made from sheet metal of the desired thickness is first punched out so that it has the appearance shown in Fig. 1 and edgewise like that in Fig. 2. The first forming operation in a press is that illustrated in Fig. 3, while a second operation causes it to have the appearance indicated in Fig. 4. After it has been trimmed to dimensions it has the shape shown in Fig. 5. The next step is to form a sphere of it under the press and to ream out the hole to size. When done it looks like Fig. 6. In Fig. 7 is shown a sectional view of the ball after a metal plug has been forced into the hole to reinforce it. This serves to stiffen the ball. The joint is now filled with galvanizing, tinning or brazing material and the whole placed in a furnace and heated so that the mass will cover the surface and penetrate the joint completely. In Fig. 8 the ball is shown ready for melting the galvanizing material and in Fig. 9 a completed ball is illustrated. Figure 10 gives a detail of special construction. The balls thus made, the inventor claims, may be used as ornaments, anti-friction balls, casters, valve balls, etc.

¶The manufacture of paper from beet pulp is to be undertaken in Colorado.

THE "BARGEES" OF THE FRENCH RIVERS

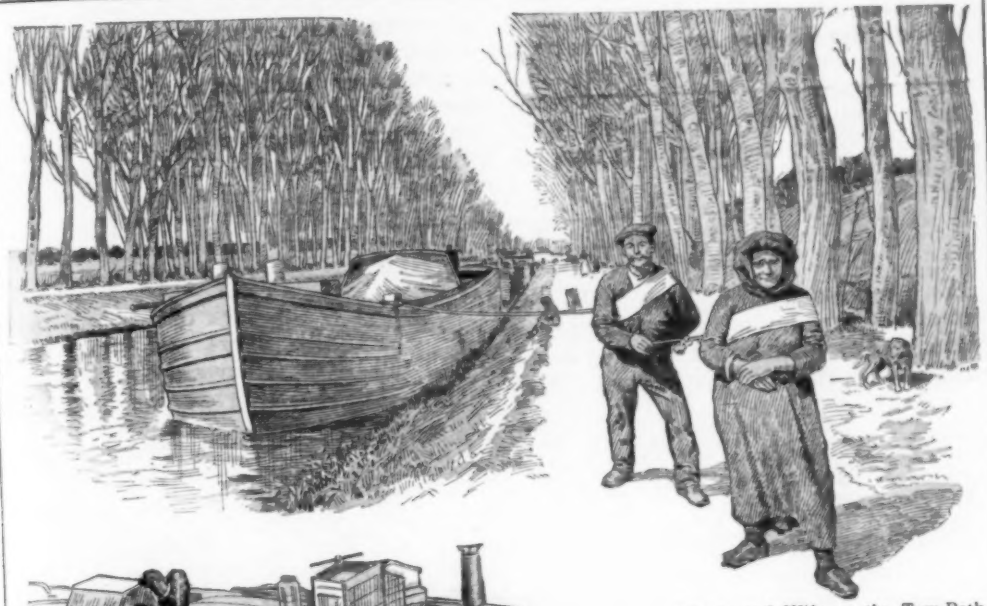
The life on the innumerable barges that traverse the rivers and canals of France, carrying cargoes of any kind of material imperishable within a month, is interesting and fascinating. Each barge represents a private residence, inhabited by the owner or navigator, his wife, one or more children, and often a dog and a cat.

"The bargee folk live according to nature and inclination—that is, they avoid fixed rules," says World's Work, London. "There is a glorious uncertainty as to every detail of their existence. It is impossible for them to tell beforehand what rivers and canals they may have to traverse. For a barge does not confine its journeys to a single line or route, but from month to month is sent down from Paris over a widely varying area and veritable network of 'liquid roads.'"

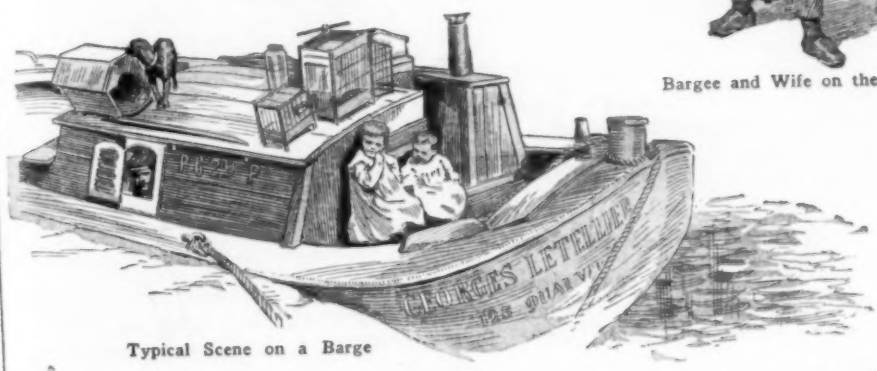
The speed of the passage depends on whether the barges are towed by tugs, drawn by horses, or by the bargees themselves, which often occurs on short narrow canals, as one of the illustrations shows. Barge traffic is the cheapest form of water transportation, although slow, and many million tons of cargo are carried by them annually. On the larger waterways as many as 10 or 15 barges, sometimes more, are slowly towed along by puffy little tugs.

In summer the occupants of the barges bathe in the rivers constantly, for the bargees can swim like water rats. At ordinary times it is customary to wash when it is considered desirable, at any hour, and usually on the main deck.

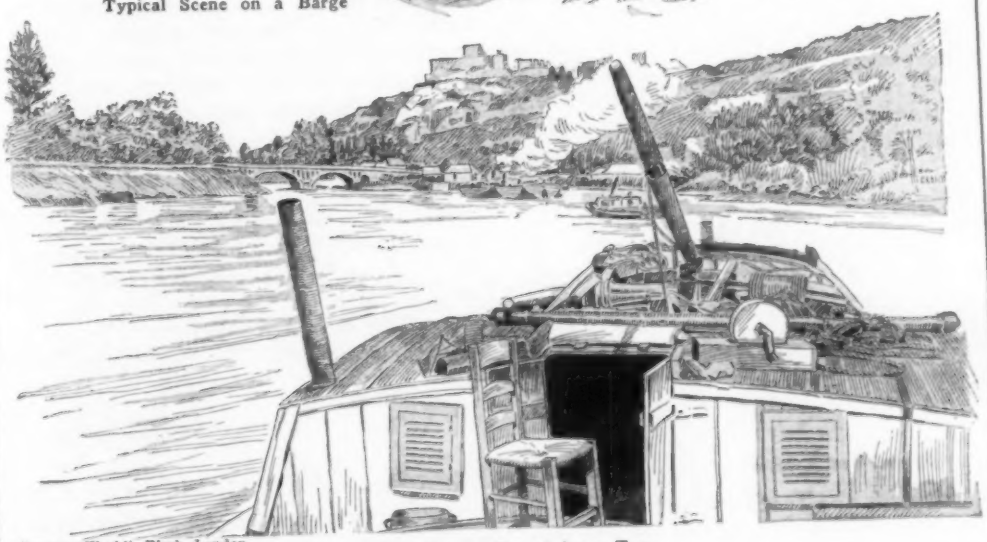
These water gipsies refuse to be bound by unprofitable and unnecessary fetters. They daily feel the delight of unknown coming things. In matters matrimonial French bargees differ greatly from their general countrymen, repudiating the bargain and barter system of choosing a wife. If a young man falls in love, he proposes to the girl without interference from parents, and



Bargee and Wife on the Tow-Path



Typical Scene on a Barge



Courtesy World's Work, London

String of Barges Towed by a Tug

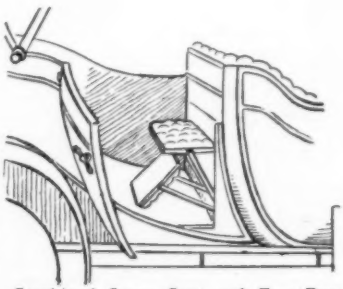
he proposes quickly. He must know his mind and know it at once, for after meeting the girl in some quay or port, the barges may move and they may never see each other again for years. The bargees rarely intermarry with land-folk, but sometimes with bargees of other countries.

When barges pass each other, there follows a lively exchange of salutations, and friends and relatives who have not encountered each other for months, sometimes years, shout eager greetings and scramble across for short visits. Family affection is said to be always strong.

NEW AUTOMOBILE ACCESSORIES

Five accessories of interest to the automobilist are shown in these illustrations. They include a combined foot-rest and spare seat, a spare seat that folds into the floor, a writing case with electric light arrangement, a special tool cabinet, and a dust shield that can be used as a table.

Dust Shield Converted into Table

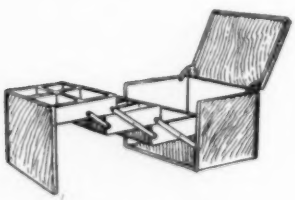


Combined Spare Seat and Foot-Rest

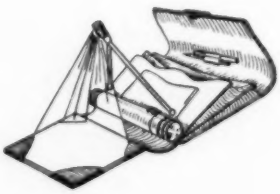
Some sort of a foot-rest is considered a necessary convenience for occupants of the rear seats of a car. To meet this, an English concern has devised a piece of furniture which can be used either as a brace for the feet or as a spare seat. The foot-rest is converted into a seat by turning its face over and attaching it to slides in the back of the forward seat. The other spare seat shown in the illustrations is devised to fold into a recess in the floor when not in use.

The dust shield is very convenient, when converted into a table, as a surface on which to examine road maps and guides. The arrangement of the extending joints is very clearly seen. Used as a shield, it protects the occupants of the rear seat from wind and dust.

One of the most ingenious accessories recently placed on the market is the writing-case provided with a battery and adjustable electric lamp. The bat-



Special Tool Cabinet



Electric Lighted Writing Case

Spare Seat That Folds into Floor

tery is of the same type as the circular flash-lamp. It is claimed to give eight hours' light, and can be used for reading as well as writing. Its arrangement in connection with the writing-case is clearly illustrated.

The other accessory shown is a tool cabinet provided with three sets of trays, connected in such manner that they may be drawn out to form tiers like those of steps. The side of the cabinet, which draws out with the top tray, forms a support.

SEWAGE-DISINFECTING BLEACHING POWDER

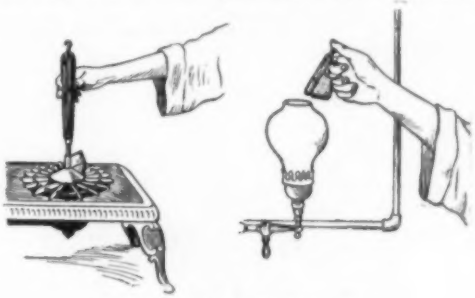
Bleaching powder, an impure commercial product manufactured in large quantities by modern electrolytic methods at Niagara and by earlier chemical methods in Europe, is now being used for disinfecting sewage. Owing to the fact that at Niagara it is a by-product of the much more important caustic soda industry, its present market price is low.

Upon mixing with water, it goes into solution only partially, a residue of carbonate of lime and an excess of free lime remaining in the tank as a white sludge. To the layman one of the most striking features of this process of disinfecting sewage is the relatively small amount of disinfectant necessary. For crude sewage an amount of so-called "available chlorin" equivalent to about 5 parts per 1,000,000 parts of sewage, which amounts to about 125 lb. of bleaching powder to 1,000,000 gal. of sewage, suffices.

The present market price of the bleaching powder is $25 per ton. So it will be seen that the cost of disinfectant is only about $1.70 per million gallons of sewage disinfected.

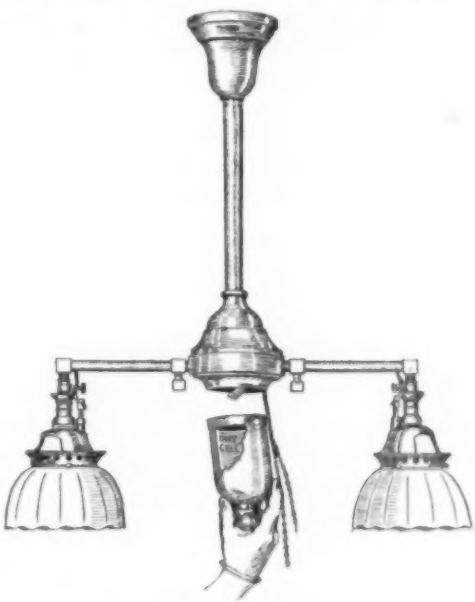
NEW GAS-LIGHTING DEVICES

Convenience in lighting is one of the favorable features in the use of electric lights that gives electricity a great advantage over gas for illumination. The manufacturers of gas and of gas fixtures are trying to overcome this by securing handy lighting devices. Two of the latest attempts are shown in the



Novel Ideas for Igniting Gas

accompanying illustration. One firm has brought out a device for lighting gas stoves and a smaller one for igniting the gas in lamps and automobile headlights. Another concern has placed on the market a fixture which contains a small dry battery which ignites the gas jet, a sharp pull on a cord operating it. A small piece of flint-like substance against which a piece of rough steel brushes, is the means of obtaining a spark in the former devices. The hood of the gas-stove lighter acts as



Dry Battery Ignites Gas Jet

a pocket for the gas and ignites it quickly.

FLOATING CRANE FOR HOISTING BOATS

The peculiar requirements of the docks at Danzig, Germany, caused the construction of the floating crane

German Floating Crane in Operation

shown in the illustration. It is provided with a water ballast chamber for off-setting the load which it hoists. The crane has a capacity of 60 tons. The hoisting engine and boiler installation is so mounted that the weight aids in balancing the load raised by the crane.

NEW METHOD OF STAGE LIGHTING

A Spanish engineer has developed a new method of stage lighting in theaters by means of which the glare of the ordinary arcs and clusters are done away with. He uses an arc lamp as the ordinary source of light, but the rays, instead of falling directly on the scene, are thrown against a series of silk bands, which are unrolled and set in any position by means of pulleys. The bands serve to reflect the light and diffuse it perfectly. The devices also include a sky, formed in a quarter of a sphere lined with a dead white coating. The diffused light is thrown into this dome and gives the illusion of unlimited space.

Still another arrangement forms clouds which have a more natural, less rigid appearance than the ordinary stage cloud. The result is secured by the use of mirrors, which reflect painted screens representing clouds. When the mirrors are rotated the clouds appear to be moving slowly across the sky.

BACK-REST FOR MOTORCYCLE SADDLES

Motorcycle manufacturers are gradually developing a new type of seat for motorcycles to take the place of the ordinary bicycle saddle, one new departure being a bucket seat not unlike the driving seat of an automobile, only smaller and lighter. But the ordinary motorcycle is still equipped with the saddle seat, and to make this more comfortable, the back-rest shown in this illustration has been introduced. It is attached to the frame of the saddle in such a way as not to interfere with the rider in dismounting, this being its chief feature. When the rider removes his weight from the saddle, the back-rest automatically falls backward out of the way, which it cannot do unless the rider's weight is absolutely away from it. To place it in position

Back-Rest for Motorcyclists

again, all the rider has to do is to lift it up until it clicks into the desired notch.

¶ Noiseless paper for programs is being used in Germany.

MOTOR LIFEBOAT ENGINES

Many difficulties had to be overcome before the installation of gasoline engines in lifeboats proved successful, but for some time past both the United States and England have had several such boats in operation. The first requirement, of course, was the placing of the engine in a water-tight compartment. As it is often impossible to open this compartment for hours at a time in a heavy sea, the engine must be started, controlled, and run for an indefinite period out of sight.

In the English boats sufficient fuel and lubricating oil is available for a 12-hour run. Air is admitted to the carburetor by indirect communication with the atmosphere, so that the danger of flooding with water is eliminated. The air is drawn from the hold of the boat, through a large water-tight bend fitted inside the engine compartment. Air enters through valves fitted at the top of each end-box bulkhead, from which pipes are carried down to the hold.

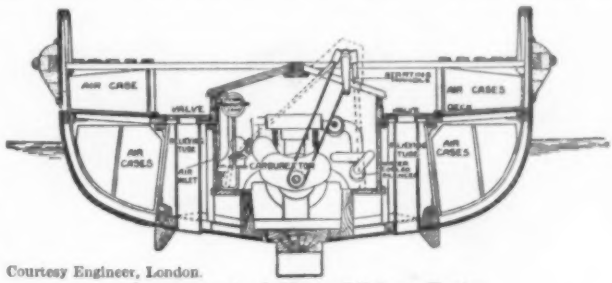
The necessity of automatically stopping the engine when a self-righting boat tips over was met in the following manner: An automatic cut-out switch, fitted to the ignition apparatus, becomes operative when the boat goes over to a certain angle, and the engine stops. This is necessary because, when the boat goes over, the crew may be thrown out, and it would not be well if, on righting, it should run away and leave the men in the water. When the boat rights itself, one of the crew turns the crank and the engine at once starts again.

¶According to reports from Europe, His Holiness Pope Pius X has caused a phonograph to be added to the musical instruments in the Vatican. Records made by the famous instrumental players, especially of the violin, which he is said to admire greatly, are provided for his pleasure.

A TELEPHONE AT EVERY TEE

Telephones at every tee is the latest equipment for golf links in the middle west. The innovation was started by the officials of one of the golf clubs outside Chicago.

Many business men desire to play golf, and yet can ill afford to be out of direct reach of their offices for a couple of hours at a time. With a telephone at every tee, this drawback no longer exists.



Courtesy Engineer, London.

Arrangement of Motor Lifeboat Engine

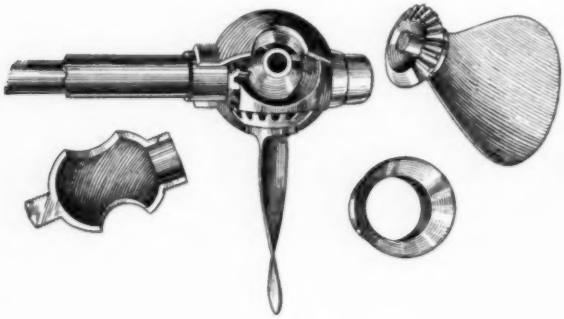
PNEUMATIC PAINT "BRUSH"

The paint sprayer or "brush" as it is called, which is shown in the illustration, is in the nature of an improvement over the air brush which has proven such an advantage to the painting trade. By the attachment of a large receptacle for paint, it makes possible the continuous use of the brush over a large surface without the necessity of continual refilling. The paint is drawn up from the jar and thrown with a slight force against the surface being painted.

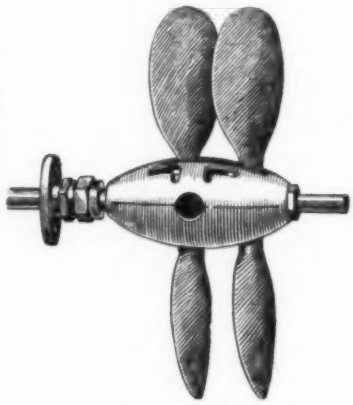
Paint Sprayer for Continuous Use

ADJUSTABLE MOTORBOAT PROPELLERS

Two propellers of interest to motorboat enthusiasts are shown in the accompanying illustrations, one being a double-acting reversible propeller, and the other a propeller with which the sleeve on the main shaft is rotated in reversing.



Propeller Reversed by Rotating Sleeve



Double-Acting Reversible Propeller

The former consists of four blades set in a movable hub, and supported by four bearings. At positions of full speed in either direction these blades lie in parallel planes. When it is desired to change the speed, to decrease it, or reverse the direction of the boat, a lever is thrown in the desired direction. In reducing the forward speed of the boat the forward pair of blades turn so that they counteract the forward driving action of the rear set of blades and consequently diminish the speed. When the reverse lever is pushed to further reduce the speed, the rear pair of blades begin to change their pitch, and at neutral the two blades absolutely balance each other. When the backward driving force of the front pair of blades becomes stronger than the forward propelling force of the rear pair, the boat changes the direction in which it is traveling. During all the changes of speed, or at position of full stop, the propeller is still turning in the water at the same speed, and the same load on the engine is maintained constantly. Thus, engine racing is entirely eliminated, as the work is always the same.

The other propeller is of an entirely different principle from that of the ordinary reversible propeller. The idea is that of rotating the sleeve on the main shaft instead of sliding through the stuffing-box, as is the usual practice with reversible propellers. The drawing shows a three-bladed propeller with one blade removed, and one of the others turned in a neutral position for relieving the engine of a load in starting. The third blade is out of sight behind the hub.

HOW THE GOVERNMENT TESTS ITS COAL PURCHASES

The United States government buys about seven million dollars' worth of coal every year for use in the Navy, in public buildings in Washington and other cities, and for other purposes, about one-third of it—mainly coal used in public buildings—on specifications under which prices are fixed according to the value or quality of the coal delivered by the successful bidder.

A definite standard of quality for the coal thus purchased is specified by each bidder and this standard is considered in awarding the contract. If the value of the coal furnished is below the standard fixed, a discount is made from the

contract price; if its value is above the standard, an allowance is made for the excess of value and a proper sum is paid in addition to the contract price.

The value is determined by tests and analyses made by the geological survey on samples taken from the coal furnished by the contractor. These analyses and tests show the quality of the coal in terms of fixed carbon, volatile matter, sulphur, ash, and moisture, and especially its heating value in British thermal units, as determined by calorimetric tests.

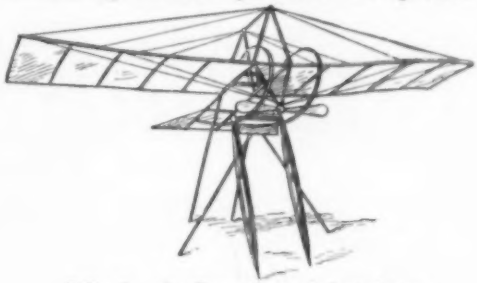
Until within a few years the agents of the government, in buying coal, relied upon the integrity of the dealer and the reputation of the mine or district from which the coal was obtained, and these formed the only possible assurance that the coal was equal in quality to the grade to be furnished. The new method has been so successful that it will probably be gradually extended to cover a larger share of the government's fuel supply.

The new plan has not yet been applied to fuel purchased for the vessels of the United States Navy, but does cover about 400,000 tons of coal bought for use on the Isthmus of Panama and about 140,000 tons used on steamers plying from New York to Colon.

LAUNCHING DEVICE FOR AEROPLANES

This launching device for aeroplanes created much interest at the last aero exhibition in England. It is a simple device, consisting of two or more pairs of stilts hinged to the frame of the aeroplane in such a way as to be out of the way in flying, but forming a support for the machine in starting. The aeroplane is raised upon the stilts by the lifting power of several attendants, or by block and tackle. Then the engine is started, and, when speeded up, the clutch is thrown, bringing the propeller into operation. The aeroplane, forced by the propeller, begins to fall forward, but before it can reach the ground sufficient speed is gained to keep it flying.

The device is designed to provide a launching means by which aeroplanes



Stilts for the Launching of Aeroplanes

can be operated from rough ground without rails, towers, or even a preliminary run.

MOTORCYCLE WITH TWO-SPEED GEAR

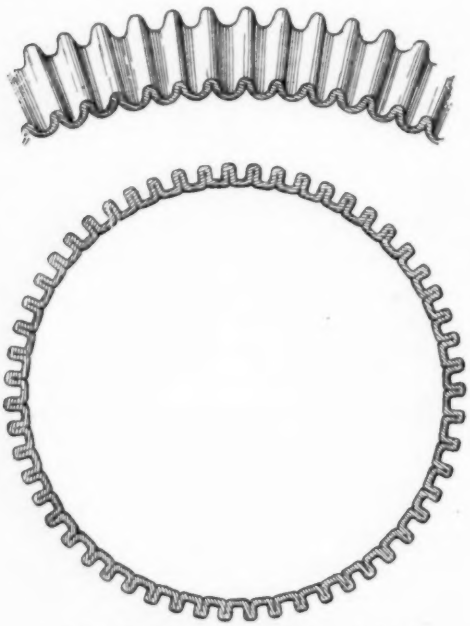
Every year the designers of motorcycles adopt more and more the features of the automobile for the smaller vehicle. The application of the high and low gear principle to the motorcycle, controlled by foot pedals, is the latest acquisition. In trials which have been made with motorcycles thus fitted the double gear system has worked per-

High and Low Gear Pedals on Motorcycle Footboard

fectly, and, it is reported, has added to the enjoyment of riding. The pedals are located on a footboard on the left side of the machine.

PRESSED STEEL GEARS

A new way of making gears is to form up teeth out of ribbons of steel. Bevel, spur and internal gears can be

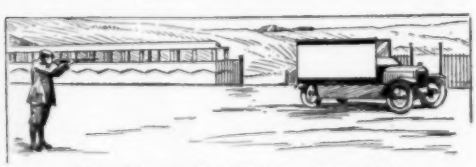


Teeth Formed Out of Ribbons of Steel

made by this new method. The rim with the teeth is secured to suitable arms or spoked hubs by welding or brazing. The teeth are not equal in shape to those that are cast, but they are stronger than the cast gears of equal weight.

AUTOMOBILE AS MOVING TARGET

The Brooklands track, which is England's finest motor speedway, is not only used for racing, but for automobile and auto accessory tests of all kinds. One



Shot Test with Moving Automobile

of the recent tests was to determine whether or not the charge fired from a shell at a moving target "strings." That is, whether the last shots, or the slower traveling shots, trail off like the tail of a comet.

A steel target plate, sufficiently long and high to protect the body of the car and its driver from injury, was mounted on one side of an automobile, which was run past the marksman at speeds of 30, 40, 50 and 60 miles an hour. No matter at what speed the car was traveling, there was not the slightest sign of the shots stringing, as in each instance they practically made a circle.

A shot from a gun travels at anything over 500 miles an hour, whereas a partridge, for instance, seldom flies at a speed of more than 40 miles an hour.

WORKMANSHIP IMPORTANT IN CONCRETE MAKING

The importance of good workmanship in mixing concrete is clearly demonstrated by a test made at the laboratory of the technologic branch of the United States geological survey. Three firms doing concrete work were asked to furnish gangs to mix and place concrete for cubes and test beams. The same materials were supplied to all three gangs, and the cubes and beams were tested under the same conditions.

The maximum variation between the test results was about 100 per cent, parallel specimens made by the laboratory employes testing to about the same strength as those of the gang securing the maximum results.

With a richer mixture the greatest difference in results was about 60 per cent, thus showing that an increase in cement tends to offset poor work to a considerable extent. The test beams were 13 ft. long, and were designed to fail under compression, so as to give a truer index as to the strength of the concrete.

¶A French association for the prevention of accidents is offering a prize for a safety automobile crank of improved design.

VISUALIZING THE ACTIVITIES OF THE MICROBE

With the use of the ultra-microscope in connection with the electric moving-picture machine, some remarkable results are being secured. The spectacle of microbes, enlarged 30,000 times, showing their activities in the human blood, will soon be thrown on the white screens of moving-picture theaters as well as before bodies of students. The moving-picture theaters have a great opportunity for increasing the interest of the public in scientific subjects, and they seem to be taking advantage of it. Presented in a clear and convincing manner, the wonders of nature are as interesting to the average person, as the comedies usually depicted.

Fig. 3

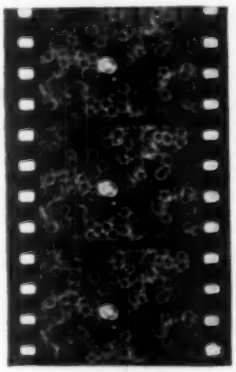


Fig. 1

The portions of films here shown are from some made by Dr. J. Comandon, of Paris, by combining the ultra-microscope with the moving-picture machine.

The accompanying illustration, Fig. 1, shows a negative taken on a French electric moving-picture machine with three pictures of a drop of blood indicating the position of the white and red globules and microbes at three consecutive exposures, while Fig. 2 shows a similar positive set of illustrations. The negatives, Figs. 3 and 4 show a drop of blood clearly indicating the movement of the microbes. The corkscrew appearing parasites and their rapid movements are clearly indicated in the negative film, Fig. 3, while other forms of microbes are indicated darting about like serpents among the healthy red globules of the blood.

The moving-picture machine flashes upon the screen consecutive pictures of these films at the rate of 16 per second and the movements of the living bacilli are faithfully reproduced. The white globules of the blood are seen attaching themselves to these bacilli, devouring and enveloping them.

By the use of the ultra-microscope many bacilli are now made visible which are not distinguishable from the white field of the ordinary microscope, the microbes themselves being transparent.

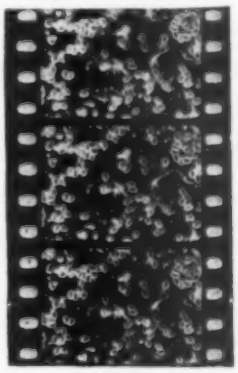


Fig. 2

In using the ultra-microscope with the moving-picture machine, a powerful light is thrown upon the subject from an electric lamp placed at one side of the apparatus instead of projecting rays of light through the object.

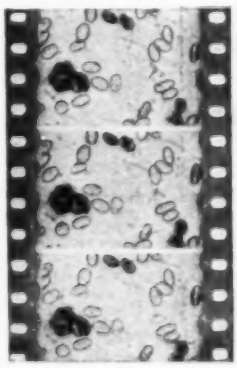


Fig. 4

The light is refracted in such a manner that none of the rays enter the tube of the microscope and the objects appear as bright spots on a dark background so that many new bacilli are made visible by this apparatus which could not be studied until the development of the ultra-microscope.

An electric arc lamp of several thousand candlepower taking a direct current of 30 amperes is util-

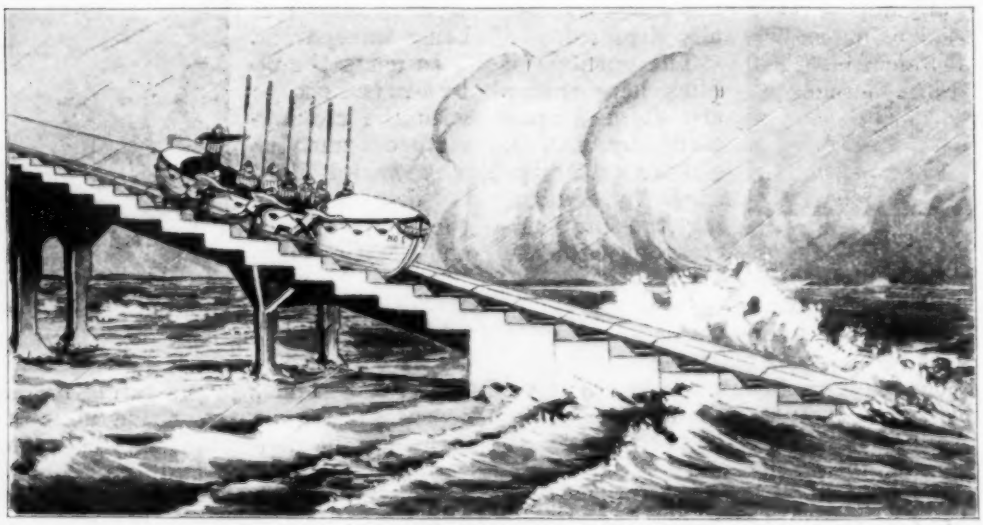
ized in connection with the cinematographic camera, the rays of the electric light being concentrated by a diaphragm and a series of lenses upon the objects, a moving disk being employed to cut off the light synchronously with the moving-picture machine so as not to overheat the objects photographed. The heat from the powerful light would kill the bacilli, were the exposure continuous. In addition to the reduction of heat by the successive exposures, each of a fraction of a second, the rays of light are also passed through a glass tank of cold water which absorbs much of the heat.

It is maintained that this remarkable combination of the moving-picture machine with the ultra-microscope can be utilized not only for studying rapid movements in microscopic animal life, but may also be employed for the investigation of the extremely slow movements of cell growth by the biologist.

The moving-picture machine can synthesize the very slow movement as met with in embryology by increasing the speed of the film producing the pictures shown on the screen, in the same manner that the rapid movements of the microbes are analyzed by the reduction of the speed of the cinematograph.

CONCRETE LAUNCHING WAYS FOR LIFEBOATS

An unusual example of concrete work has just been completed near Wick, in the north of Scotland, in the form of launching ways for the Ackergill life-saving station. Such ways have formerly been constructed of timbers or of rolled-steel sections, and the use of concrete is a new departure.



Concrete Launching Ways in Scotland

The ways consist of an elevated platform located well up on the shore and an incline runway leading out into deep water. The runway is provided with the necessary rolls and guides for the proper handling of the boats, and a series of steps for the use of the crew. The total length of the structure is 194 ft. and its width is about 16 ft. The end of the incline entering the sea is formed of a solid mass of concrete, while the remainder is made up of reinforced beams, columns and slabs. Open construction is used on the incline so that the smallest possible resistance will be offered to heavy seas.

STEEL BANDS FOR POWER TRANSMISSION

Steel bands for power transmission are rapidly coming into use, according to a German magazine. Count Zeppelin has adopted such bands in place of leather belts for the driving of the propellers of his airships, and many electrical concerns are experimenting with them.

The advantages of the steel bands are the small elongation compared with leather belts, ropes, and other methods of driving, and the impossibility of the slinging noticed with loosely mounted belts. Differences in temperature and moisture have no appreciable effect on steel bands, and the width of such bands need be only about one-fifth that of a belt for the same purpose.

SMOKELESS FRYING-PAN

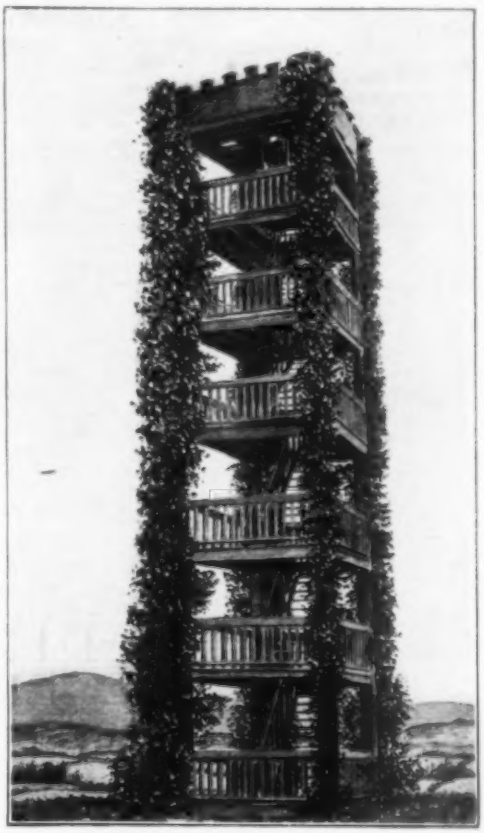
A frying-pan, said to prevent smoke and odors from emanating from the food being cooked, even onions being included, has been placed on the market. One side of the wall of the pan, as can be seen in the illustration, has an extra section of wall attached. At this point the inner wall is cut low, and between the two is an opening. With the cover in position on the pan the natural draft of the cooking range starts a circulation through the pan

Smokeless and Odorless

and over the food being cooked, this circulation drawing all smoke and odors down into the fire chamber.

A LIVING TOWER

Rising 100 ft. above the top of a hill, which is itself 300 ft. above the surrounding country, in Sonoma county,



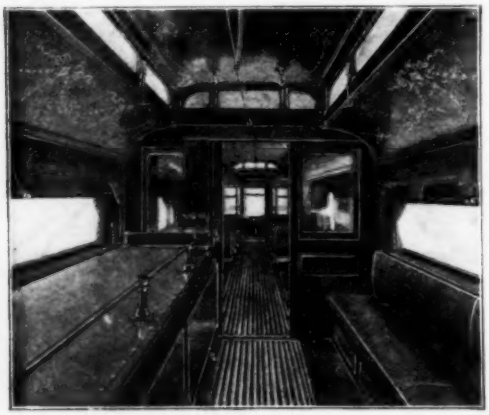
Growing Tower in California

California, is an observation tower unique because it is "alive."

The supports of the tower, which is said to be the only living one in the world, are young redwood trees. These trees, all of about the same size and growing in such position that they form an almost perfect square, were originally about 150 ft. high, but the tops were cut off to form a support for the upper platform. The tower is divided into six stories, the floor of each resting on beams anchored to the tree trunks by steel cables and bolts. Stairways lead from floor to floor, and a view of the surrounding country for many miles can be seen from the top.

FUNERAL CAR OF CHICAGO CITY RAILWAY

This very complete funeral car is one of two specially constructed for the use of the Chicago City railway on



Interior of Funeral Car

one of its south side lines It is 43 ft. long and has two sections, one of which is for the casket and pallbearers and the other for the mourners.

The most interesting feature of the arrangement of the car is the casket compartment, which opens from the outside, as shown in one of the illustrations. A panel or horizontal door, which appears as part of the wooden body of the car when closed, drops down and is supported by chains. The inside of this door and the floor of the casket compartment are fitted with rollers for the carriage on which the casket is placed. The compartment is also accessible from the inside of the car by means of a removable panel.

The section of the car containing the casket compartment is lighted by two long windows, that on one side being over the casket compartment, and the other being over the side seat just opposite, for the pallbearers.

SAFE MADE SPECIALLY FOR RADIUM

A most ingenious safe has just been completed for the British Radium Corporation as a receptacle in which to store the precious substance. The problem presented to the makers of the safe was not only to provide a strongbox that would be burglar proof, but which at the same time would prevent the escape of the radium. Radium emanations will pass through the thickest and hardest steel, consequently the inner coffer of the safe was made of lead, 3 in. thick, inclosed within a burglar-proof steel shell. One of the special features of the safe is the means of collecting the radium emanations before the coffer is opened.

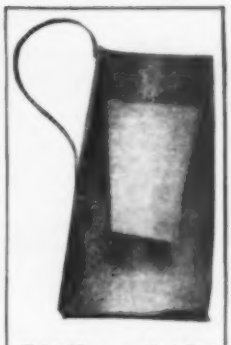
The total weight of the safe is 3,000 lb., and it is designed to hold 100 lb. of radium, should that great amount, valued at billions of dollars, ever be produced.

¶Three firemen were killed in Macon, Ga., recently, and an auto fire engine wrecked, by the bursting of one of its tires while turning a corner at high speed.

Exterior of Car Showing Open Casket Compartment

Oil Can with an Inner Compartment, Used in Thousands of Sales

SWINDLING THE POOR WITH FALSE WEIGHTS AND MEASURES



Trick Measure that Cut the Contents Down More Than One-Half

PILED high against the wall of one of the rooms in the headquarters of the New York Bureau of Weights and Measures there rests the most amazing evidence of the trickiness of the small merchant and the push cart peddler ever collected in one city. For years this department has waged ceaseless warfare against the short weight frauds among the small dealers, and a mass of interesting relics can be seen in the department's museum, showing how clever the street merchant is in tricking his customer with false weights and scales. But the trick measure has not been used in a sufficient number of cases to justify a general raid for the purpose of running these rascals out of business permanently.

Frank McCoy, Acting Chief of the New York Bureau of Weights and Measures—He Is Holding a Ruler to Show the Real Depth of a Trick Pail

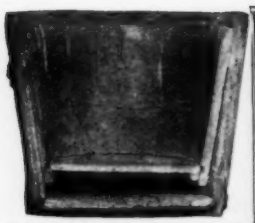
Recently it was decided by Frank McCoy, acting chief of the Bureau of Weights and Measures, to start a crusade on this particular line of unlawful endeavor. The result of this raid astonished even the inspectors of the department, who are used to every kind of fraud perpetrated by the push cart men and small dealers.

The most audacious swindle unearthed is illustrated in one of the accompanying pictures, in which Mr. McCoy is shown holding a rule in the interior of a pail with the falsest of false bottoms. The bottom of the pail extended only a few inches from the top. Even when dealing with the unsuspecting customers among the foreign element on the East Side, where this trick pail was seized, it would be palpably impossible to palm off a quantity of potatoes so short of the apparent measure as this false measure would be. The dealer realized that and success with the fraud depended almost entirely on his own ability to browbeat the customer. The pail of potatoes, apparently a full pail of ordinary size, would be placed on view, marked at so much the pailful. When the purchaser bit on the bait and bought the "pailful," there would of course be a row when it was found that it was about a fourth of what the contents of the pail seemed to be.

"But" said the dealer, "I sold you the contents of the pail. If you thought the potatoes went to the bottom it was your fault and not mine. All you get is what the pail held."

The trick it seems, is a common one and the victims are always the very poor.

The poorest of the poor are also the victims of the coal pail swindle. One of the illustrations, a pail photographed when cut through the middle, shows



Pail Within a Pail; Small One Jammed into Larger One

A Double Basket Which Cuts Down the Apparent Contents One Half

This Held a "Bucketfull" of Coal; Note V-Shaped Compartment.

that the inner compartment is V-shaped, and cuts the contents down about a third. This was used by a dealer who sold coal by the bucketful. By quick work he could always hide the fact that it had a false bottom, pouring the contents into the customer's basket, and quickly slipping the empty pail out of sight.

Of dry measures seized there was an almost unlimited number. One of the most flagrant cases of fraud is selected for illustration. It seems strange that such an obvious swindle should have been possible of accomplishment, for the measure held less than half the quantity its exterior would indicate. This measure was used by a push cart peddler who sold peanuts and other small dry commodities.

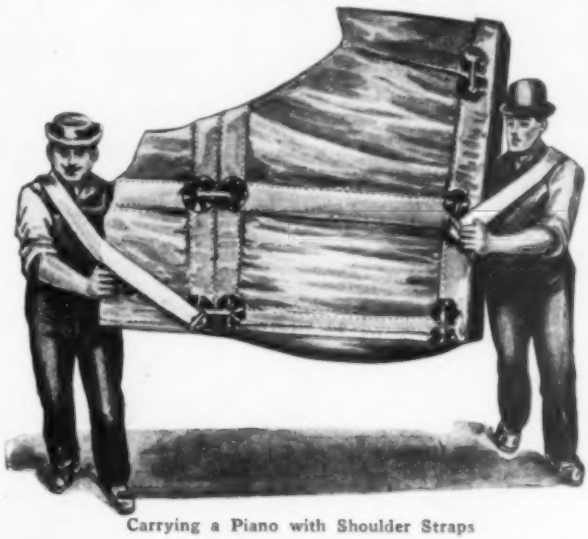
A 5-gal. oil can seized had an inner compartment that must have helped considerably to swell the receipts of the small dealer who devised and used it. This swindle was an easy one, for who among the customers would measure out the oil to see whether or not the dealer had furnished five gallons or only four and a half?

In the immense quantity of sales made through a small pint dipper the tricky dealer at whose place it was seized must have reaped a harvest of pennies of the poor. He had cut down the dipper from the handle, doing it gradually so as not to make the operation too obvious, but cutting it so thoroughly that when the trimming had reached the outer edge the dipper was far from being full measure. This dipper had been in use in all probability for months before the inspectors pounced upon it, and in all that time the poor of the neighborhood who made their purchases by the dipperful had been victimized on every trade.

"It is difficult to prosecute these crooked tradesmen," said Mr. McCoy. "They hide behind so many subterfuges. The ignorance of the people upon whom they prey is the chief reason why we cannot send the short-weight man to prison. The push cart men do not call their false measures by the name that the contents call for according to the exterior appearance of the measure. They cover the trickiness of the deal by marking their false measures in general terms and the deception nine times out of ten is not noticed by the customer. We relieve the public as far as we can of these swindles by seizing the crooked devices and short measures. Some day a law will be passed that will deal with the cases more specifically."

HEAVY PIANOS CARRIED BY TWO MEN

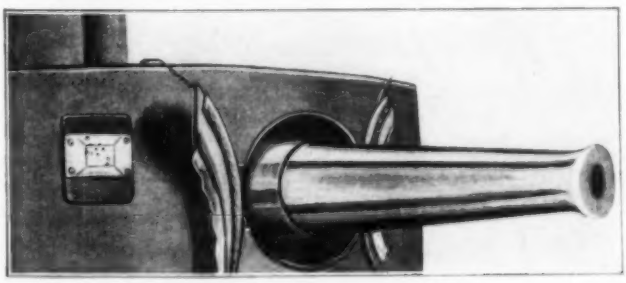
A novel method of carrying heavy grand pianos has been adopted by the piano movers in Germany. It usually takes three or four strong men to carry a grand piano safely, but by means of a novel device, which includes heavy leather shoulder straps on which the piano is supported, two men can do the work. After having taken off the legs of the piano, the carriers screw T-shaped bolts, 1 in. in thickness, into the runs, one on each side. A leather carrier belt is thrown over the cross-bars of these bolts, and the loop of the belt, as shown in the accompanying illustration, is thrown over the shoulders of the carriers. The body of the piano has previously been wrapped in a canvas provided with several belts and clasps. The heaviest piano is thus transported with comparative ease by two men of average strength up or down any number of stories, quickly and safely.



Carrying a Piano with Shoulder Straps

WRECK RAISED BY COMPRESSED AIR

The attempt to raise the steel steamer "Fleswick" which sank in the harbor at Cork, Ireland, as the result of a collision, was successfully carried out by the compressed air method. The vessel, which was 128 ft. long, rested on her side in 27 ft. of water. The coal forming her cargo was first removed, and the hull was then made as nearly tight as possible by closing the hatches with steel plates, placed by divers. Air was then pumped in, and after considerable trouble, the ship was floated.



Recording Extraordinary Target Hits

FAMOUS TARGET HITS REPRODUCED IN BRASS

Following the method of marking buildings and articles of historic interest by attaching brass information plates to them, the officers of the H. M. S. "Natal" have caused to be attached to each gun little facsimiles in brass of the target hits made in record tests.

The H. M. S. "Natal" secured the coveted honor of being the crack gunnery ship of the British navy in the 1909 tests. The brass plates showing the hits of the gun, to the barbette of which it is attached, also bears the names of the gunners.

Trained Cheetah Being Conveyed to the Hunt

CHEETAHS TRAINED FOR THE HUNT

Trained cheetahs are used in Persia and India in much the same manner that hounds are used in European and North American countries. The game they are used to hunt is principally deer and antelope. The cheetah is an animal with black and brown spots, resembling a leopard, but longer in body and limb.

The Indian princes keep packs of them for the hunt. The heads of the hunting cheetahs are usually covered with a hood until within 200 yd. of the game. The hoods are then removed and the animals creep stealthily towards the herd, and, having approached as near as possible, pounce upon their prey, killing with one blow of the paw. If unsuccessful, the cheetah does not attempt to give chase to the herd, but slowly, as if ashamed, creeps back to the hunters. The tamed cheetah is said to be a very docile and companionable animal, despite its fierceness in the hunt.

THE BLIND AS MASSEURS

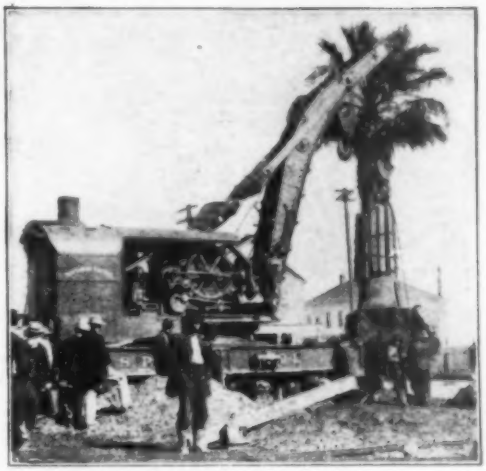
Massage, practiced by the blind for more than 1,000 years in Japan, is proving an ideal occupation for the blind in America, and the number of blind masseurs is rapidly growing. Professor Yoshimoto, principal of the Model College for the Blind in Tokio, recently visited the United States. He is very enthusiastic as to the employment of the blind as masseurs and urges that they be trained for the profession. The blind masseur has proved very satisfactory in Japan, and, according to Professor Yoshimoto, is highly appre-

ciated by both doctors and patients. Almost all the blind in Japan are masseurs, and until recently they possessed special privileges in that country. The students spend from three to five years at the school, first obtaining a general knowledge of anatomy, physiology, and pathology. Then they study massage and the ailments it cures. The blind develop a more sensitive touch than persons with sight, and soon train the fingers to rapid and skilful movements.

The blind Japanese masseurs also have many ingenious methods by which they can well make up for the deficiency of sight. Though they cannot see the expression of their patients' faces, they can observe them just as well by lightly feeling certain muscles in the face. Thus, they can determine whether the treatment is strong or weak.

RAILROAD WRECKER TRANSPLANTS FIVE-TON PALM

The Southern Pacific railroad found it necessary recently to remove its depot at Roseville, Cal., to a new location. The depot was an especially pretty one, one of the features of its surroundings

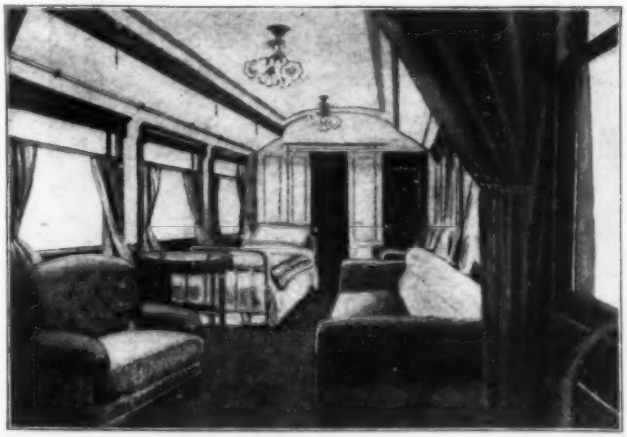


Gardening with a Wrecker

adornment for the depot grounds, so moved the palm also. This was accomplished in a novel manner.

A large quantity of earth was excavated and loosened and the big tree which, with the earth clinging to its roots, weighed about 5 tons, was lifted from its resting place by a railroad wrecker, was moved about 400 ft. and set back into the ground again.

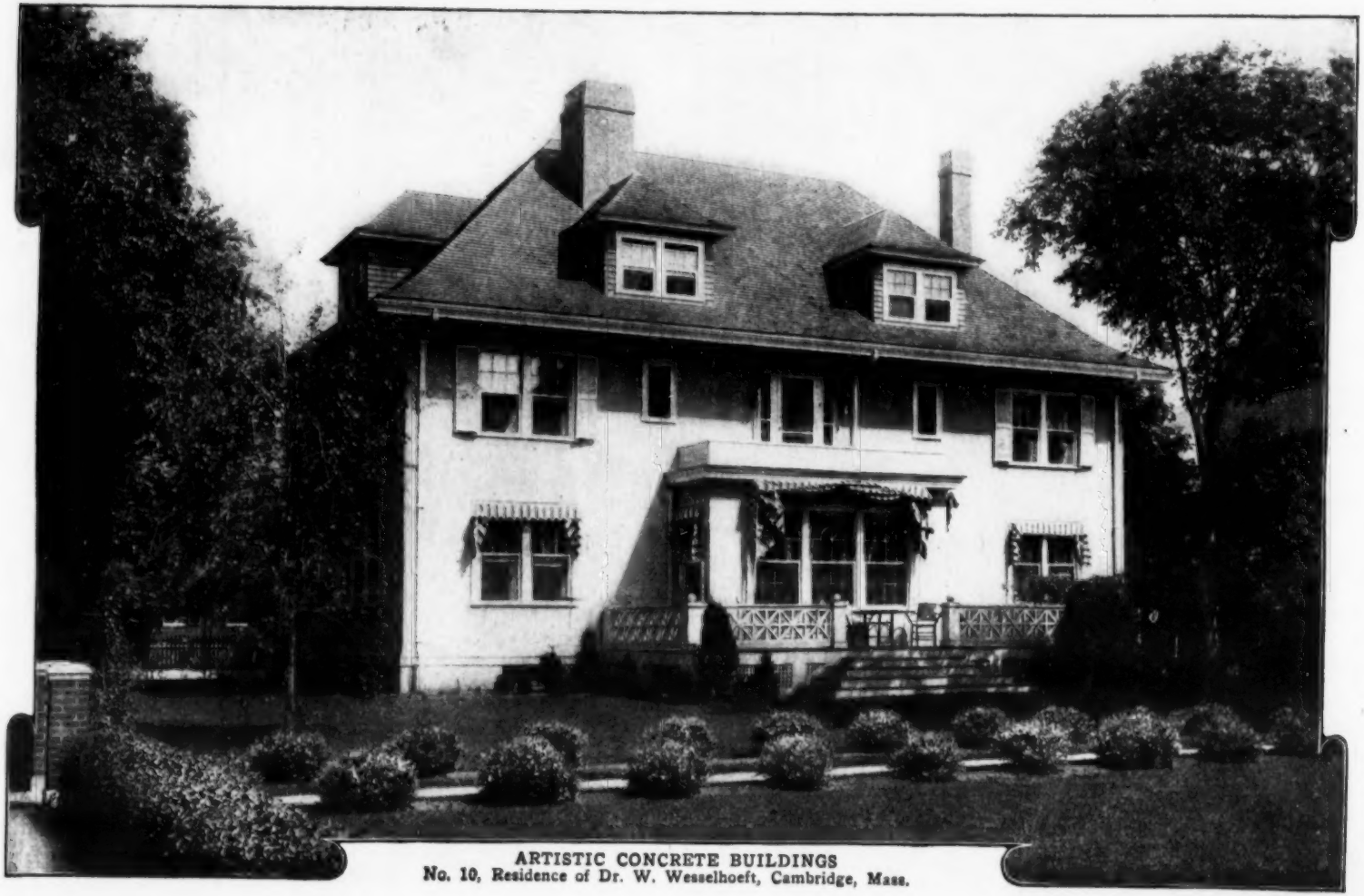
INVALID CAR ON ENGLISH RAILROAD



Railway Car for Invalid

One of the latest and most interesting acquisitions to the rolling stock of the Great Northern railroad of England is an invalid car for the use of people who can afford such luxuries. The car has two first-class corridor compartments, the invalid compartment, attendants' and luggage compartments, and two toilet compartments. The invalid compartment, which is shown in the illustration, occupies the middle of the car, so as to clear the resting bed well from the trucks. Besides the bed, this compartment is furnished with a couch, settee, and several easy chairs.

being a palm about 35 ft. high which was growing within 10 ft. of the structure. The company did not want to lose the beauty of the palm as an



ARTISTIC CONCRETE BUILDINGS
No. 10, Residence of Dr. W. Wesselhoeft, Cambridge, Mass.

HEAT

Part VII—How Heat Is Measured

By J. Gordon Ogden, Ph. D., Professor of Physics, Fifth Ave. High School, Pittsburgh

[This is the seventh article of a series by Dr. Ogden, in which well known subjects will be discussed from the standpoint of their relation to modern mechanics. The following subjects were discussed in the months indicated: February, "The Nature of Heat and How It Is Measured;" March, "How Low Temperatures Are Produced;" April, "Some Effects of Low Temperature Upon Matter;" May, "The Production and Uses of High Temperature;" June, "High Temperatures and the Rare Metals;" July, "How Heat Travels." Succeeding articles will include Steam, Boilers, Ice, Radiation, etc.]

A THERMOMETER tells us the degree of temperature, but it does not tell us anything concerning the quantity of heat that may be in a body. A pint of water at 10° C. is much cooler than an ounce of water at 80° C. but the pint contains more heat than the ounce. To attempt to estimate the heat of a body by its temperature would be just as absurd as to estimate the size of a river by its velocity without considering its volume. In that case a mountain brooklet would be larger than the Amazon, and a fast running creek would be greater than the Mississippi.

Heat is measured by reference to some standard unit just as silk is measured by the yard, butter by the pound, or milk by the quart. Many different kinds of heat units have been suggested, but the most common, and the one most easily understood and most generally used in engineering practice is known as the British thermal unit, abbreviated as B. t. u. A British thermal unit is the amount of heat required to raise one pound of water one degree Fahrenheit. This is the yardstick of heat, and by its use we are able to estimate the quantity of heat in a pound of fuel, or to determine the ratio between the heat values of different substances just as easily as the grocer weighs out his sugar, or the draper measures off a definite length of calico.

As has been indicated, water is taken as the standard for the measurement of heat just as it is taken as the standard of specific density. A cubic inch of gold weighs 19.6 times as much as a cubic inch of water. We therefore say that the specific density of gold is 19.6. Even as we find that different substances such as gold, silver, copper, zinc, tin, and so forth, have different densities as compared with water, so we find that all substances

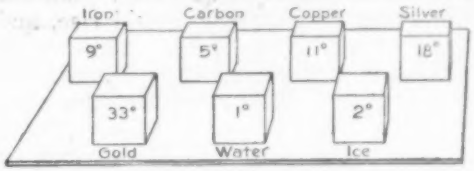


FIG. 1

Equal Weights of Different Substances Showing Degrees of Temperature Each Would Rise While Water Rises One Degree

have peculiar and distinct capacities for taking up this curious motion known as heat. A pound of iron, for example, at a temperature of 100° F. contains more than three times as much heat as a pound of gold at 100° F. and only one-ninth as much heat as a pound of water at the same temperature. Why is this? Again we are compelled to admit that we do not know. Even as some bodies are much better conductors of heat than others, so some bodies have a greater or lesser capacity for absorbing the vibrations which constitute heat. In Fig. 1 is shown a number of substances on a hot plate, all weighing the same amount and receiving the same quantity of heat. The cubes of course would not all be the same size, but are made so for convenience. The number placed on each cube indicates the degree of temperature to which it would rise while water rises one degree. The ratio between the amount of heat required to raise the temperature of a body one degree, and the same weight of water one degree is known as specific heat, and it is useful sometimes to know how to make this calculation. The operation is exceedingly simple, and depends upon the

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fact that when two bodies of different temperatures are placed in thermal contact, there will be a heat exchange exclusively between the two bodies, and the one will lose what the other gains. For example, suppose we wish to determine the specific heat of some new alloy. First determine its weight and temperature; then place it in water of known weight and temperature. In a short time the alloy and the water will have the same temperature. If the alloy was colder than the water its temperature would rise, and the temperature of the water would fall, and vice versa. The quantity of heat remains the same after the mixture as before. It is the relative amount that each substance rises or falls in temperature that tells the tale. If the alloy weighs one pound and the water the same, and the temperature of the alloy falls one hundred degrees, while that of the water rises five degrees, then 100 degrees of the alloy equals five degrees of the water, and we know the specific heat of the alloy is just one-twentieth of that of the water. The outline given below is a convenient form in which to express the facts stated above.

WATER	ALLOY
Amount taken.....1 lb.	Amount taken.....1 lb.
Degrees of change....5	Degrees of change....5
Specific heat.....1	Specific heat.....X

$$5 = 100\ X$$
$$.05 = X = \text{Specific Heat of Alloy.}$$

In a former article mention was made of "latent" heat as it was termed by the early philosophers. Let us review our knowledge of it. Latent heat is a form of energy, locked up as it were within certain bodies, such as water and steam. If ice be placed in a pan of water the thermometer will show a temperature of 32° F. Put the pan on the fire, the temperature of the water and ice will not rise but will remain at the freezing point until all the ice is melted. Let the water remain on the fire. Steadily the temperature will rise until the boiling point is reached, and there it will remain until the water is all evaporated. The heat given to the mixture of water and ice without changing the temperature was utilized by the ice in its transformation into water. Ice at the freezing point, plus sufficient latent heat, equals water at the freezing point. Likewise the heat given to the water at its boiling point was utilized in the actual work done in changing water into steam. Water at the boiling point, plus enough latent heat, makes steam. Conversely when water freezes or steam condenses, this energy, which has been locked up, reappears as "sensible" heat. Latent heat is most conveniently measured by the "mixture" method. For example, suppose it is required to determine the latent heat of water. This is done by adding water of known weight and temperautre, to ice of known weight and temperature. Water at 32° F. added to ice at the same temperature will have no effect upon the ice. If the water be warmer, some or all of the ice will melt. Add, say a pound of water, at 112° F. to a pound of ice at 32° F. The ice will melt, and the temperature of the mixture will be 32° F. In other words, the 80 degrees lost by the water is the price paid to the ice to liquidate or to go out of business and become water. The latent heat of water is therefore 80 thermal units, since as before stated, a British thermal unit is the amount of heat required to raise one pound of water one degree Fahrenheit, and the pound of water fell 80 degrees or in other words gave up 80 thermal units in converting the ice into water. The latent heat of steam is also easily determined. Water is boiled in a suitable vessel and the resulting steam passed into cold water whose temperature and weight are known. The steam will be condensed by the cold water, whose weight and temperature will thereby be increased. The added weight represents the amount of steam condensed. The rise in temperature represents the heat set free by the change from steam to water. Suppose the initial weight of the cold

water was one pound. Its added weight is one ounce; its increase in temperature is 33½ degrees. If an ounce of steam will heat a pound of water 33½ degrees, equivalent to 33½ heat units, a pound of steam would set free 16 times that amount, or 536 heat units, the latent heat of steam. Of course this is only a rough calculation, as several minor factors must be taken into consideration in a calculation of this nature, but the method outlined will serve to give a general idea of how steam is compelled to tell us some of its secrets. As a general thing heat causes bodies to expand. And now comes another curious fact, the reason for which we do not know. No two bodies have precisely the same rate of expansion, iron has one rate, gold another, aluminum another, and so on down through the list. Figure 2 represents the action of heat upon two equal strips of iron and brass riveted tightly together. The Bunsen flame will soon cause the compound rod to bow, the brass side being convex, as brass expands more than iron. Advantage is taken of the unequal expansion of different substances in the construction of the grid-iron pendulum, in thermometers, thermostats, and the balance wheel of a watch, the consideration of which will be deferred to a later article. The same substance, however, always expands at the same rate, and it is of great importance sometimes to know precisely the amount of expansion of a given metal at a given temperature. The method of determination is easily understood. A rod of iron, say, is carefully measured, its length being determined to the thousandth of an inch, and its exact temperature noted. The rod is placed in a jacket around which steam at 212° F. is caused to pass. Suppose the rod is 3 ft. in length, and its temperature 62°F. When placed in the steam it will of course become 212° F. a rise of 150 degrees. The rod is again carefully measured. The increase in length is due to the 150 degrees. Divide the increase by 150, and the amount of expansion caused by one degree will be known. Divide this answer by 3 (the length of the rod being 3 ft.) and the amount of expansion of one foot of iron for one degree of temperature,

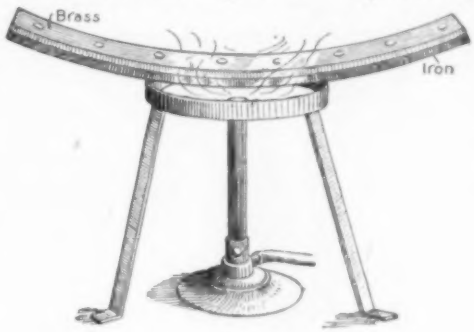


FIG. 2

Experiment Showing the Unequal Expansion of Iron and Brass

will be known. This number, which, in the case of iron is .000012 inches is known as the coefficient of linear expansion. In laying the rails of a railroad, the expansion of iron in summer and its contraction in winter must be taken into account. A blacksmith slips a red-hot tire over a wheel, and the tire is on to stay, as the subsequent shrinking makes a perfectly tight fit. A machinist shrinks a metal collar on a frame in the same manner, the pressure due to contraction being enormous.

And now we come to the consideration of the relation between heat and work. Everyone knows that hammering a nail will make it hot, but few people know that there is a direct numerical relationship existing between the amount of work done and the quantity of heat produced. Until the close of the eighteenth century heat was believed to be a fluid. Practically every scientist of note up to that time, with the exception of a few men such as Bacon, Locke, and La-Place, thought that the reason mercury occupied more bulk when heated was on account of an invisible fluid which permeated the mercury and caused it to expand. In 1798, Count Rumford noticed that the chips of steel resulting from the boring of a

cannon in the military workshop of Munich, were so hot that he could not hold them in his hands. This puzzled Rumford as he could not reconcile the

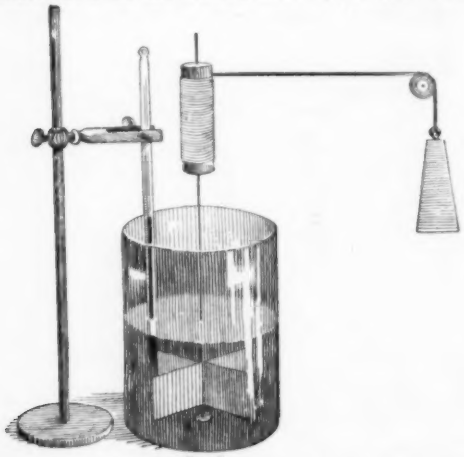


FIG. 3
Apparatus with Which Dr. Joule Found Mechanical Equivalent of Heat

theory that heat was a fluid with the fact that both the cannon and the chips were extremely hot, and that the heat had obviously arisen from the friction of metal upon metal and not from the advent of some unexplained fluid. While Rumford was trying to solve the puzzle, Davy, over in England, demonstrated that two pieces of ice rubbed together in a vacuum would produce heat enough to melt the ice. Obviously the heat could not have come from the ice, and it could not have come from the air, as that possible source had been eliminated. Whence, then, did it come? Rumford thought it was produced by friction, and in order to demonstrate the truth of his theory, secured a large piece of brass hollowed out at one end, and fitted into it a cylinder of steel weighing 5 tons. By an ingenious mechanical contrivance attached to the cylinder, the latter was made to revolve within the brass 32 times in a minute. Water was placed in a box around the brass, and at the end of two hours and a half the water actually began to boil. Work had been transformed into heat without the shadow of a doubt. This experiment of Rumford's was a death-blow to the theory that heat is a fluid, and was the foundation of the belief that heat is a form of motion. It was a good start on the road to the truth, but even Rumford and Davy did not suspect that there is an exact relationship existing between the heat evolved from friction and the amount of work done. Almost 50 years elapsed before this was determined. In 1843, Dr. Joule of Manchester, England, performed his classic experiment, which revealed to the world the mechanical equivalent of heat. Figure 3 is a diagrammatic representation of the simple apparatus used by Joule in his demonstration. A paddle was made to revolve with as little friction as possible in a vessel containing a pound of water whose temperature was known. The paddle was actuated by a known weight falling through a known distance. A pound falling through a distance of one foot gives a foot pound of energy. At the beginning of the experiment a thermometer was placed in the water, and the temperature noted. The paddle was made to revolve by the falling weight. When 772 foot pounds of energy had been expended on the pound of water, the temperature of the latter had risen one degree, and the relationship between heat and mechanical work was found. Joule tried the same experiment again, using mercury instead of water, and verified his original discovery again and again. And what in plain language does this discovery mean? Simply this; the amount of energy required to raise a pound of water one degree Fahrenheit is sufficient to raise it 772 ft. against the force of gravity. Later determinations have shown that the correct figure is 778. One British thermal unit equals 778 foot pounds. The importance of this discovery cannot be overestimated, as it is the basis of practically all the calculations so essential in engineering practice relative to the construction of engines, and the determination of their capacities as regards the work to be done.

HOUSE OF CONCRETE AND SEWER TILE

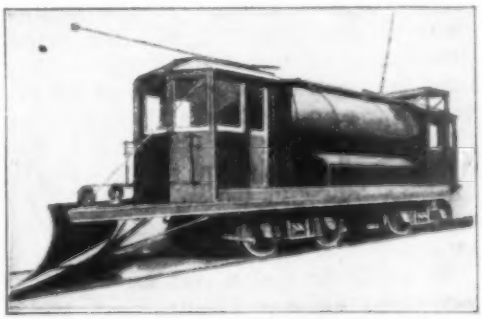
Ordinary conduit or sewer tiles, which had been rejected for conduit work because of slight flaws, form the body of this concrete house in Wilmette, Ill. The foundation is built of four-way tiles with a 6-in. solid concrete wall on the outside. Above the foundation 5-in. one-way tiles were used with a monolithic concrete wall of about 4-in. thickness built against them on the outside.

Sewer Pipe Forms Frame of This House

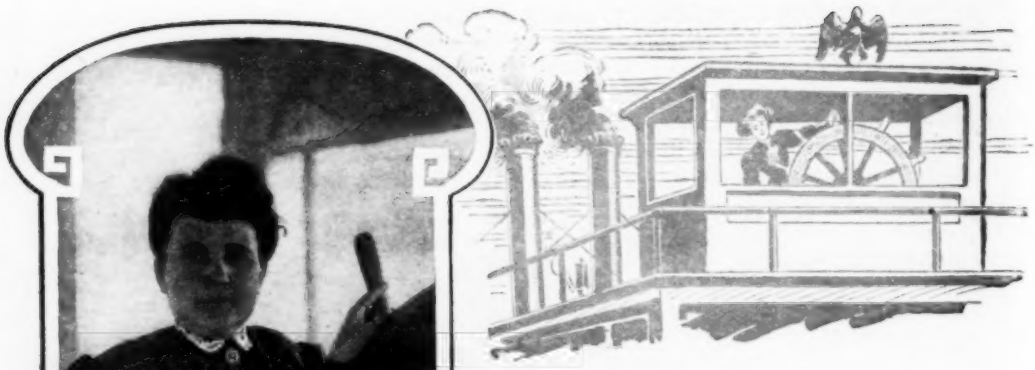
The tiles were first laid up roughly in cement mortar. Forms were then built up on the outside and concrete poured in, the tile wall itself forming the inner form. The walls inside were plastered directly against the tiles. Secured at a very low cost the tiles proved very satisfactory for the work.

STREET CAR SERVES AS FIRE ENGINE, SNOW PLOW AND LOCOMOTIVE

A combination car of unusual design, which can be operated as a snow plow, a sprinkler, a fire extinguisher, sand car, line car or locomotive, has just been put into service by an Illinois railway company which operates both steam and electric trains, and carries freight as well as passengers. The car has an overall length of 45 ft. when operated as a snow plow, and an overall length of 33 ft., 6 in., when the plow attachment is removed. The tank on the car has a capacity of 5,000 gal., and when used as a sprinkler, water is sprayed out by an air pressure of 20 lb. This air supply is derived from a compressor having a capacity of 90 cu. ft. The air is compressed to a pressure of 90 lb., after which it is reduced by means of valves, to a pressure of 20 lb., at which it is fed into the tank. When the car is to be used for fire protection the air is fed into the tank at a pressure of 40 lb., which enables it to throw a stream 100 ft. into the air. A cab is located at each end. The car weighs about 112,000 lb. when used as a locomotive.



A Versatile Street Car



A River Captain for 20 Years

A WOMAN STEAMBOAT CAPTAIN

The woman shown in the accompanying illustration holds the novel distinction of being the only woman boat commander ever licensed by the government to command and pilot river steamers on the Ohio, Little Kanawha, and Mississippi rivers. She is Captain Mary B. Green, wife of Captain Gordon Green, owner of the line of steamers bearing his name.

Mrs. Green began her river life 20 years ago while still in her teens and a bride of only a few months. Unwilling to be separated from her husband she took up his life, and finally became commander of the Str. "Greenland," making trips from Cincinnati to Louisville. She also navigated the vessel on one trip between Pittsburg and St. Louis. One spring the steamer was torn from her moorings and caught in the ice floes in the Little Kanawha river. Two of the crew jumped overboard in their fright and were drowned, but the woman navigator succeeded in saving the steamer from being ground to pieces by the ice.

AMATEUR WIRELESS PLANTS AS LIGHTNING ATTRACTORS

The most important reason advanced in the past couple of years for the government regulation of the thousands of amateur wireless telegraph installations springing up in every part of the country was due to a desire for supervision, so that the atmosphere should not become unduly clogged with aerograms.

Another reason has now developed, however, through the claim that the installations are dangerous lightning attractors, not only jeopardizing the residence or other buildings upon which they are erected, but also adjacent buildings. The board of underwriters of Chicago has issued the following requirements for wireless installations:

"The aerial conductor must be at least No. 8 B. and S. gauge rubber-covered wire, run on petticoat insulators on exterior of building and on knobs, cleats, or in moulding in interior of building. Porcelain bushings to be used through walls, partitions, and floors. Aerial conductor must be permanently and effectively grounded at all times when station is not in operation, by a conductor not smaller than No. 4 B. and S. gauge rubber-covered copper wire run as nearly

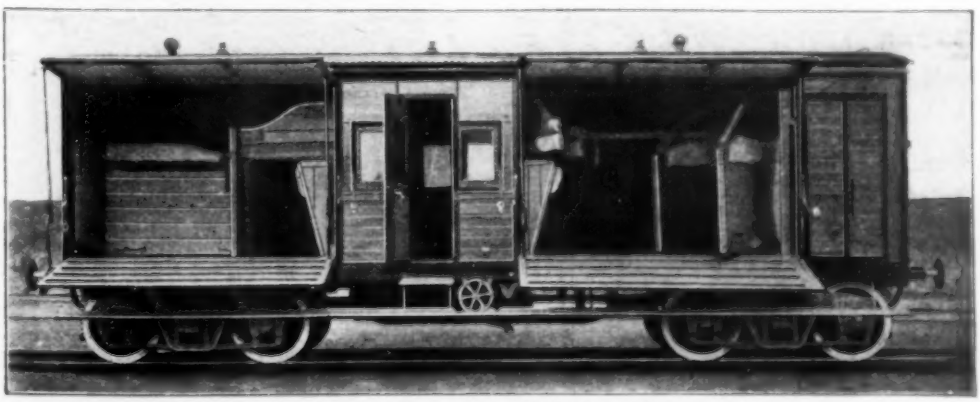
in a straight line as possible to a water pipe at a point on the street side of all connections of said water pipe within the premises, or to some other equally satisfactory artificial earth connection, such as an iron rod or pipe driven at least 5 ft. into the ground. The ground wire should be protected from mechanical injury by inclosing it in moulding at least 7 ft. from the ground on exterior of building. The switch employed to join the aerial to the ground connection must be an approved 100-ampere, single-pole, double-throw knife switch placed as near as possible to where aerial enters, and must effectively cut off all apparatus within the building. Aerial conductor may be permanently connected at all times to earth through an improved lightning arrester placed as near as possible to the point where the wire enters the building and grounded as specified above. Ground wires for lightning arresters must not be attached to gas or steam pipes within the building, nor be run inside of iron pipes."

LUXURIOUS TRANSCONTINENTAL CARS FOR HORSES

The accompanying illustration shows one of the latest ideas in cars for the transportation of horses by rail. Cars of this type are being made in England for the Buenos Ayres Pacific railway of South America. One of the features of the car is the means provided for the loading and unloading of the animals and the provision made to protect them as much as possible from the joltings incident to a long trip. The cars are equipped with special springs and with automatic vacuum brakes. A considerable quantity of feed can be stored in the end compartment designed for that purpose, and there are comfortable accommodations for the attendants.

A QUAINT RESTAURANT SIGN

The "Copper Kettle" is the name of an artistic little lunch room in a western city, which, as it faces a private thoroughfare has sidewalk privileges not granted on a public street. The proprietor has erected a quaint sign of his business on the edge of the curb in the form of an old-fashioned kettle of real copper suspended from an artistic rack. A little roof is built over the kitchen utensil, which by its oddity catches the eye and brings many a customer.



For Transporting Horses in Comfort

TATTOOING IN BAS-RELIEF

Almost any sailorman can show a tattooed design of some kind on his skin, but the tattooing on the arm of this negro of German East Africa is a novelty. The work is not sunk into the skin, but the skin is stretched up over it in relief.

Tattooing in German East Africa

OSCAR HAMMERSTEIN AS AN INVENTOR

Oscar Hammerstein's fame has, of course, been made through his grand opera ventures, and few people are aware that his ideas run in other channels, yet the records of the U. S. patent office show that he has 36 patents to his credit.

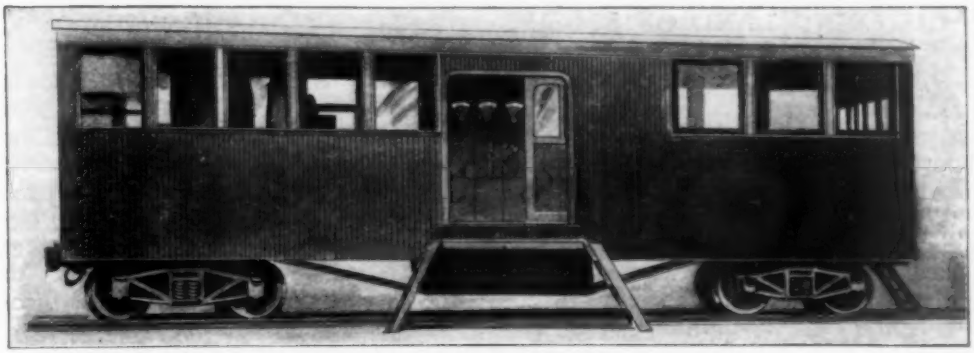
The first patent granted him was in the early seventies, and was for a washstand with which a person could wash the entire body, thus doing away with the necessity of a regulation bathroom or tub of any kind. His best inventions, however, are related to the cigar-making industry, and include compressed-air machines. From the date of his first patent on cigar machines, granted in 1880, the patent office has issued him 29 patents on machines of like nature. Some of these patents related to processes, but the majority are machines for rolling, bunching, forming, and cutting cigars or parts thereof. The last patent was issued in 1907.

In 1887 Hammerstein secured another patent on a combined washtub and basin. In 1895 he patented a fireproof floor, in 1899 a necktie provided with a washable knot and a washable apron, detachably secured to each other; and in 1903 he secured a patent on a device for smoothing silk hats. In 1906 he patented a fire extinguisher, and in 1907 a method of ventilating subways.

THE LATEST TYPE OF BASEBALL

From 1883 until last year, very little, outside of minor changes, was done in developing the baseball. The league baseball used in this period had a rubber center, and the yarn wound around it was coated with a continuous layer of rubber cement. The ball now used includes a means of preventing the inner yarn from slipping away from the

Cross-Section of Latest League Baseball



One of the Portable Sub-Stations

center of the ball, and the substitution of cork for rubber in the core. This core of cork is covered with a layer of rubber vulcanized to a certain degree of hardness, and on this is wound the usual yarn.

The cork makes possible a more rigid structure and more uniform resiliency. It is said to outlast the rubber center balls many times over, because it will not soften or break in spots under the most severe usage.

The illustration shows a cross-section of the new ball, with the cork center, rubber covering, the layer of blue woolen yarn, then white woolen yarn, then blue woolen yarn again, and the horsehide cover.

CANTILEVER STAIRWAY IN JERUSALEM

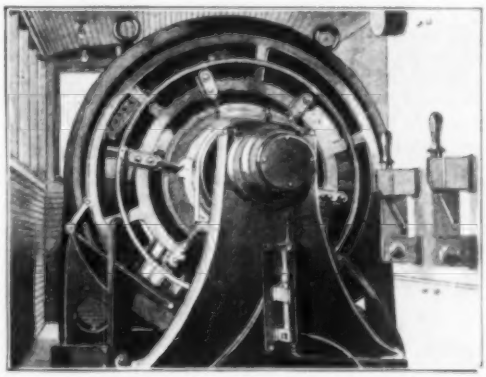
The bell tower of the German hospice (hotel) recently completed in Jerusalem is built as a cantilever. The tower is 197 ft. high and the stairway starts at the second floor. The steps are about 42 in. long, built into the wall at each end for a length of 10 in., this being the only support.

The steps are of concrete, and were made at Jaffa, on the Mediterranean sea, from shells, sand, and German cement. Each step is reinforced with a small I-beam. The under side of the steps is slanted to conform to the slope of the stairway, but the portion projecting into the wall is square, in order to secure good bearing.

PORTABLE ELECTRIC SUB-STATIONS

One of the interesting features of the power installation of the Northern Electric railway, California, is the series of portable sub-stations by which the current of 60,000 volts is transformed. These electric plants on wheels, one of which is shown in the illustrations, contain one standard 400-kw. set and a switchboard. One end of the cars is partitioned off to make tool rooms.

The portable stations must not only be located on level track, but must also be made fast in such a manner as not to be subject to vibration. This is accomplished by means of wrought iron hooks fastened to the under side



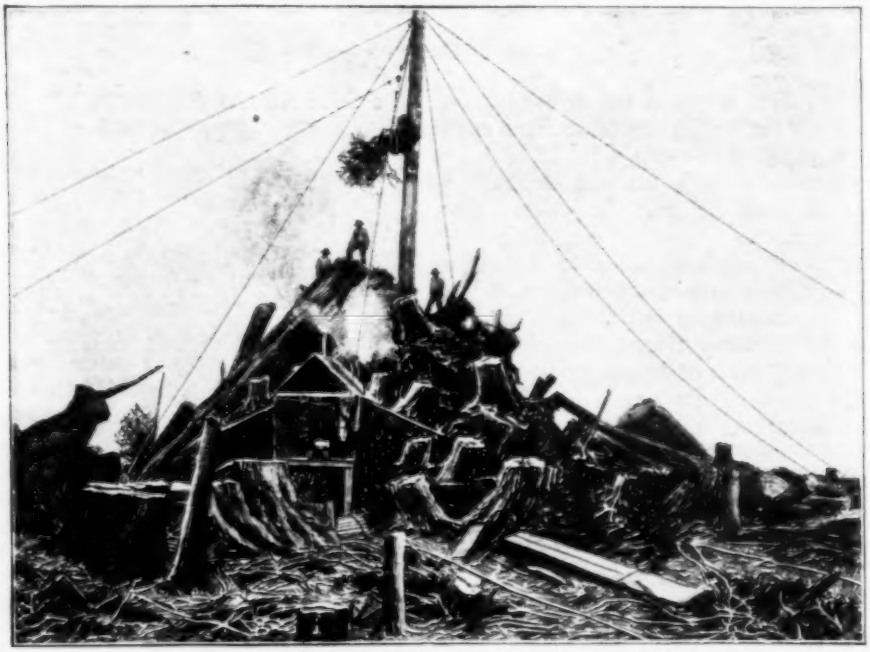
Interior of Sub-Station on Wheels

of the car-body and gripping the ball of the rails. Acting against the strain imparted by the hooks are screw jacks, which bear up against the car-body.

CLEARING LAND OF STUMPS IN NORTHWEST

This method of clearing land of stumps, used to a great extent in Washington and other states of the northwest, is both unique and economical. After the trees have been felled and the stumps blasted, a donkey engine, with upright boiler, is set up on the land for drawing the stumps into piles convenient for burning. A wire cable runs from the cable-drum through a derrick erected where it is desired to make the pile. The end of the cable is taken to the stump, perhaps a quarter of a mile away, is made fast, and the signal is given to the engineer to haul in. The stump is dragged bumping, bouncing, and sliding over the ground at considerable speed. When the stump reaches the derrick it is lifted into the air and is then dropped on top of the pile.

Piles of stumps, stacked in this way, are often as large as a huge farm building. An area of 10,000 acres was cleared in this way in Washington recently, the burning piles resembling a well-scattered town in conflagration.



Gathering Stumps for Burning with a Donkey Engine

TO TEST HARDENING OF GATUN LOCKS

Six resistance thermometers are to be embedded in the walls of the locks of Gatun dam at Panama, in order to determine the degree of heat at various stages of the hardening of the concrete, and thus find the rate of cooling.

From the time concrete begins to crystallize until it is entirely set the increase of temperature is rapid. From the setting point the increase is slow, but usually continues during the entire process of hardening, the time of which is indefinite, probably lasting for several years.

The concrete for the Gatun locks is made of one part slow setting Portland cement, three parts of sand and six parts 3-in. rock. On account of the time that elapses between the mixing of the concrete and its delivery into the forms, the mixture is made about the consistency of thin plaster. After it is placed in some parts of the wall, large rock is added, forming a cyclopean concrete.

The thermometers to be used consist of a resistance bulb and an indicating instrument, with wire connecting the

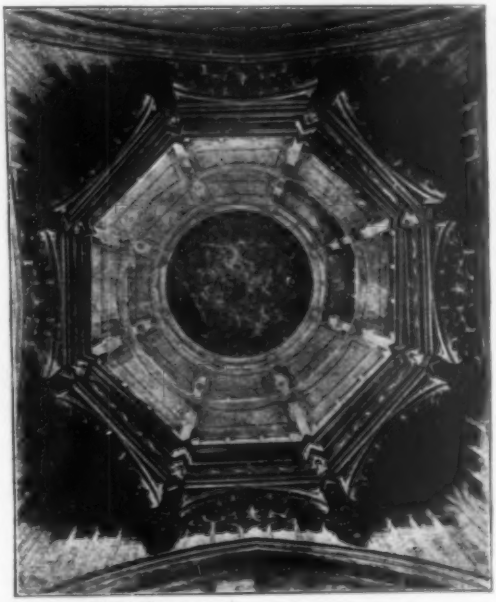
two. The resistance bulb is an iron cup in which there is inserted a specially prepared metal, the resistance of which to a flow of electric current varies with the temperature.

CAR FOR EXPEDITIOUS TRANSPORTATION OF FIRE APPARATUS

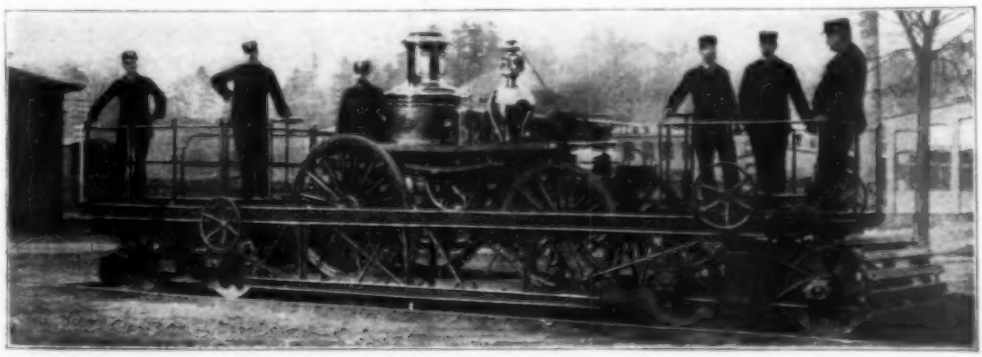
An invention that has attracted a great deal of attention in fire-fighting circles recently, is a car for the ready transportation of fire engines from point to point upon the rails either of street railways or upon the steam roads. It consists of a steel frame upon two standard four-wheeled trucks, with a low hanging platform for the accomodation of a steamer of large size. Any ordinary fire engine, such as is commonly in use in our larger cities, may be placed on board with dispatch when the call for help comes from a distance, and from a point more easily accessible by rail than by other means; and may be conveyed to its destination without loss of time in handling upon the ordinary flat car. The front truck is arranged to disconnect, letting the end of the platform down to track level. The fire apparatus is then pulled aboard by means of a winch on the rear truck, after which the front end of the platform is again raised to carrying level by chain hoist and the front truck placed in position. The whole loading operation requires about two minutes and the unloading is done in less than a minute and a half.

A UNIQUE PICTURE FRAME

This unique picture frame would draw attention because of its unusual shape were it the frame of a picture in an art exhibit, but it is not. Instead, and far more curious, it is the frame formed by the dome of the great tower of Antwerp Cathedral for the painting on its ceiling. The photograph was taken by a camera, the lens of which was pointed straight upward.



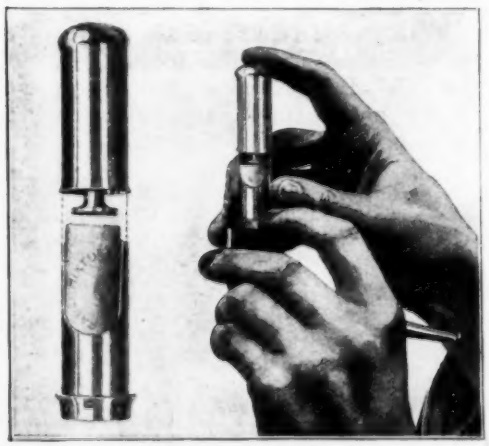
Courtesy Sketch, London
Looking Up at the Dome of Cathedral Tower



Carries Fire Engine by Rail

DEVICE FOR FILLING A PIPE

An absolutely new article has been placed on the market for smokers in the form of a pipe-filler. It is a contrivance of trifling cost that takes tobacco in specially made packets and deposits it in the bowl of a pipe, packing it to just the right degree for drawing best. The lower part of the filler is placed over the bowl, and the pressure

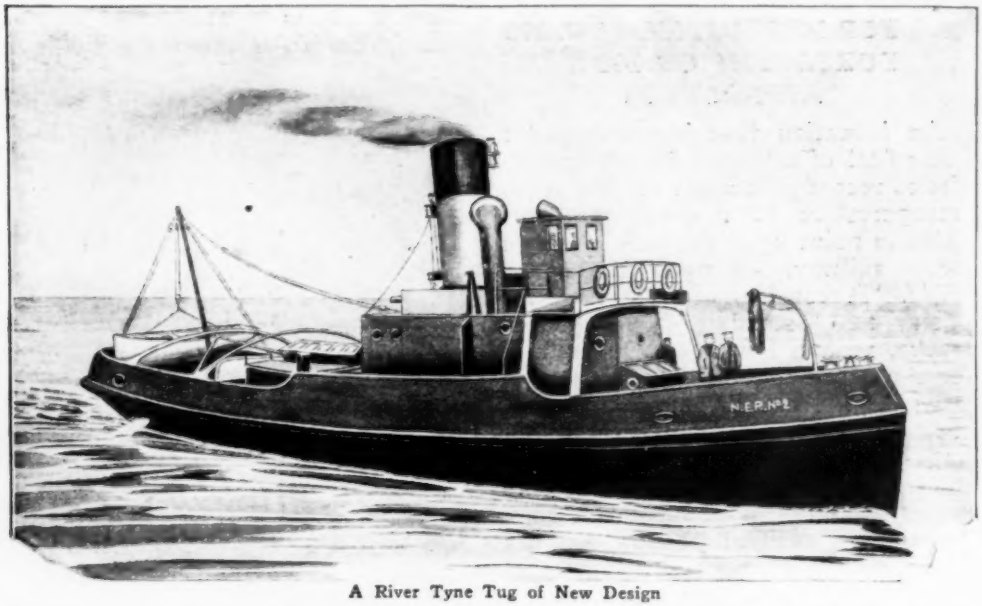


New Device for Smokers

of a finger on the upper part frees the tobacco from the packet and forces it into the pipe.

POWERFUL ENGLISH TWIN-SCREW TUG

This powerful twin-screw tug is one of two recently built for the use of the North-Eastern Railroad company



A River Tyne Tug of New Design

in connection with its docks on the River Tyne, in the north of England. It is 82 ft. long, with a 26-ft. beam and a 12½-ft. depth, and embodies many special features for the rapid and efficient handling of heavy tonnage vessels.

Owing to the large amount of traffic the space in which the vessels have to be maneuvered is very small, consequently the tugs have to be of exceptionally large power in order to get them quickly under way and to check them in the least possible distance. The two sets of compound surface-condensing engines with which the tug is fitted are capable of over 1,000 hp. for short intervals.

With a view to rapid maneuvering the keel is cut away forward and the propellers well spread, the stern at the same time being kept square to provide a maximum amount of protection. As a result, it is possible to turn through a complete circle in slightly less than a minute and in the tug's own length.

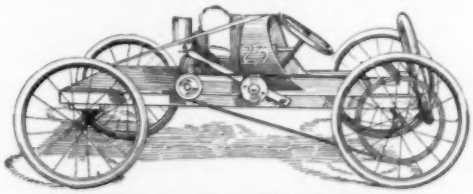
Units of One-Length Wire

SEVEN HUNDRED FORMS OF ONE-LENGTH WIRE

The 700 units of form shown in this illustration were made of wires of a given length to demonstrate the number of simple designs that can thus be formed. An English jewelry designer advocates its duplication and placing in every technical school where jewelry designing and making is carried on. The study and work of forming them covered a considerable period.

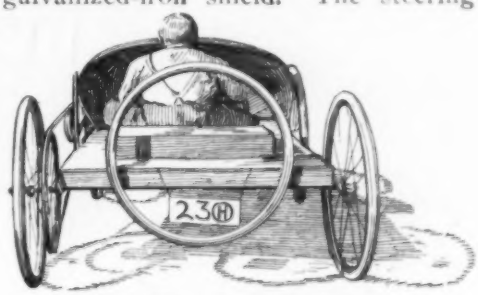
CURIOUS HOME-MADE AUTO MAKES 15 MILES

These illustrations give a side and back view of a curious little automobile made by Ralph W. Dunkle, a boy with



Side View of Home-Made Automobile

a mechanical bent, living in Greenville, Ohio. The body of this home-made car consists of a light wooden frame and floor, from the center of which rises a galvanized-iron shield. The steering



Rear View with Maker Driving

wheel is of an ordinary type. The seat is a board, and its back is formed by a circular tire. The engine is rated at 2 hp. and it gets up a speed of 15 miles an hour, through rope drive.

¶Ten huge searchlights, costing $139,000, are to be installed on the fortifications at Corregidor, at the entrance to Manila Bay.

¶An order has been placed for seventy million bricks to be used for the purpose of enlarging the fortifications at Vladivostok, Siberia.

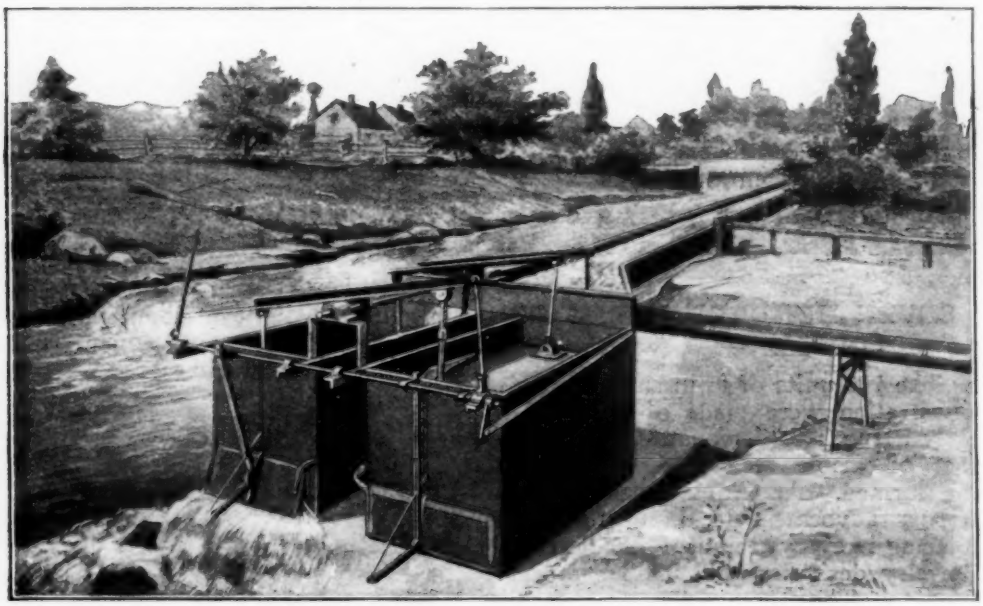
PUTTING THE SMALL STREAMS TO WORK

The great potential power of the large streams and waterways of the United States is generally recognized, and today more than ever before man is harnessing these streams to do his work.

Forming a fine network all over the country are hundreds of thousands of small streams, generally regarded as too insignificant to produce power because of the small flow of water or the absence of a fall. A motor has recently been brought out which promises to make the utilization of these small streams possible. If it stands the test, it undoubtedly has a large field, not only in the United States, but in all parts of the world.

The basic principle of this new motor is the application of buoyancy to mechanics and the harnessing of the power thus developed. A light vessel filled with air will not remain submerged in water, but will exert force to push its way to the top, displacing only its own weight of water. One of these motors is installed near Portland, Oregon, and a description of it will serve to convey an understanding of the construction and operation of the new motor better than any general description can. It is shown in the accompanying illustration.

Two metal tanks 5 ft., 6 in. deep, 5 ft., 6 in. wide, and 8 ft., 6 in. long, are placed side by side on a concrete foundation on the bank of a stream. The lower part of the front of each tank is provided with a metal outflow gate, while the upper part of the opposite end is provided with a similar gate for the inflow of water. Inside the tanks are two airtight chambers, just one inch smaller in length and width than the tanks. They are 2½ ft. deep. About 100 ft. upstream, water is diverted from the stream into a flume, built on a grade of about 2 in. to the 100 ft. In this particular case the stream is not a very small one, and all the water is not needed to operate the motor. On a very small stream the entire volume of water could be utilized in the same manner.



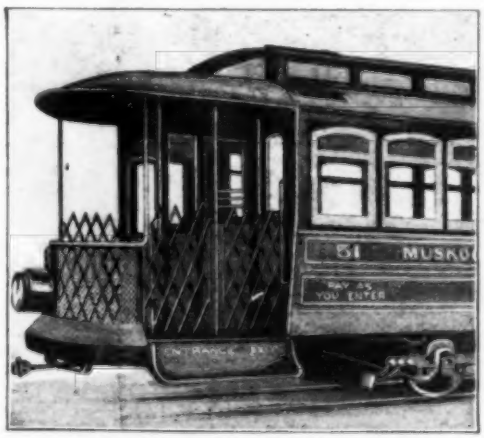
The New Water Motor in Operation

The water is permitted to enter these tanks alternately. When the inflow gate of one tank is opened the inflow gate of the other is automatically closed. Thus, as the water flows into tank No. 1 it begins to rise, forcing the air chamber up. This rise continues until the air chamber reaches its highest elevation, which occurs when the water is about 4 in. from the top of the tank. Then the outflow gate of No. 1 is automatically opened, and the inflow gate closed, at the same time the inflow gate of tank No. 2 opens, the outflow gate closes, and the operation which has just occurred in No. 1 is repeated.

Attached to the top of the air chambers are shafts connecting with a walking beam between the tanks. This is connected with two pumps which stand on the same concrete foundation as the motor, transmitting power enough to lift 36,000 gal. of water 75 ft. in one hour. This is sufficient to irrigate 100 acres of land. It is claimed that once started the motor needs no attention whatever.

PAY-AS-YOU-ENTER CARS OPERATED BY ONE MAN

Ingenious pay-as-you-enter cars that dispense with the service of a conductor have been adopted by the traction



One-Man Pay-as-You-Enter Car

company in the rapidly growing city of Muskogee, Oklahoma. The cars have standard pay-as-you-enter non-vestibuled platforms at both ends, with folding gates on the steps on both sides, but the rear platform gates are always

Method of Closing Off Rear Platform

closed and locked and passengers must enter and leave by the front platform.

By this arrangement a conductor has become unnecessary, as the passengers are under the eyes of the motorman both in entering and leaving the car. A cab about 3 ft. square, located against the bulkheads of the car between the entrance and exit doors gives the motorman protection against the weather. Passengers boarding the car pass in front of the motorman and drop the fares in a box which hangs from the window of his cab. The car is not started until the passengers have all passed in front of the motorman, who makes change when necessary.

To prevent confusion by passengers attempting to leave the cars at the rear, folding seats are provided which extend across the doorways. This feature is shown in one of the illustrations. When the cars reach the end of the line, the motorman changes his position to the other end.

The practicability of such cars on traction lines in many communities cannot be overestimated. The dispensing with the services of conductors cuts the pay-roll for car operation in half, thus making dividends possible in small cities where traction cars might otherwise be operated at a loss.

MOTORCYCLES FOR WOMEN

Motorcycling is materially a sport for men and boys in this country, but in Europe motorcycle manufacturers

English Woman Motosacoche-ing

are building machines for women and finding a ready sale for the product. The frames of the machines are designed without the upper bar, as is the case with the ordinary women's bicycle, and the engine, gasoline tank, ignition apparatus, and oil supply are carried between the double bars of the under frames.

The fear that skirts would be likely to catch in the drive transmission and result in a serious accident may be dispelled, as the makers of the machines have so inclosed the engine and gears as to make such trouble impossible.

A motorcycle built for women is called a "motosacoche."

PRACTICING GOLF WITH CAPTIVE BALL

By means of the inexpensive apparatus shown in these illustrations the golf enthusiast is enabled to practice strokes in such restricted places as only a few feet of back yard or in a large room in a house. All the strokes except putting may be practiced with the apparatus, the clubs used including a driver, brassy, iron, mashie, and niblick.

The most important part of the apparatus is a captive ball, and the other parts include two mats and a hoop arrangement. The latter is bent or formed into five inverted hoops. To the lower part of the hoop standard is attached the cord on the end of which the golf ball is held captive. Near the center of the cord is a spiral spring, which allows of stretching, and swivel-

The Commencement of the Drive — The Finish

ling connections are also provided to permit of the spinning action of the ball.

The cord, of course, can be length-

ened or shortened to meet the requirements of the space in which practice is to be carried on. In playing, the ball is placed on a mat as shown in the first illustration. The "driver" is first used, and the ball struck at with the same force that would be used on a regular golf links. If the ball is hit straight, the cord passes into the center loop through the narrow opening. If not quite straight, the cord slips into one of the other loops when the ball is driven over the rack. The center loop counts three points, the next on each side two points, and the outer loops only one point.

When the player has made a perfect drive, the "brassy" is taken up and used in a similar manner, and the same routine is gone through with the brassy, iron, mashie, and niblick. The ball, held captive on the end of the cord strikes the ground a few feet beyond the loops as shown in the second illustration. When the apparatus is used indoors, the mat, shown under the standard in these illustrations, is placed in such a position that the ball will strike upon it when forcibly brought down by reaching "the end of its rope."

SMALLEST DOLLS MADE IN MEXICO

The smallest dolls in the world are made in the picturesque Valley of Cuernavaca, Mexico, by a young woman who is a descendant of one of the old Indian tribes, says the Bulletin of the Bureau of American Republics. The operation of making

Matador Dolls—Actual Size

consists in forming a diminutive framework of wire, barely ¾ in. in length, and winding it with many turns of fine silk thread. After the frame has been fashioned to the proper lines and proportions, it is ready for dressing. The clothes are cut according to the character of the doll, and fitted carefully about the small figure.

Tiny Dolls Representing Natives

The most difficult work, that of embroidering the clothes, is then begun. With a needle that can scarcely be held by the fingers, and whose eye is almost invisible, various designs are actually embroidered on the clothes with the finest of silk threads, and so cleverly executed that even through a powerful magnifying glass the details appear to be perfect, although the entire work is done without the aid of an enlarging device of any kind. After the dressing has been completed it is necessary to add the hair. What is undoubtedly an example of the tiniest and most remarkable hair dressing on earth is then performed on each doll. Even to the details of the braids and ribbons, the work is completely carried out. The eyes, nose, mouth, hands and feet are then formed.

Only two hours are required to make each doll. Many characters, familiar to the country are represented by the dolls, dancing girls, matadors, religious dignitaries, and native types. Photographs do not do justice to the splendid coloring and wonderful execution. The sketches show the actual size of the dolls.

¶A fund of $9,000,000 is being raised by public subscription in Brazil for the building of another great Dreadnought.

¶Telephones are now being used for the transmission of train orders on 295 roads in the United States, covering 26,344 miles of road so operated.

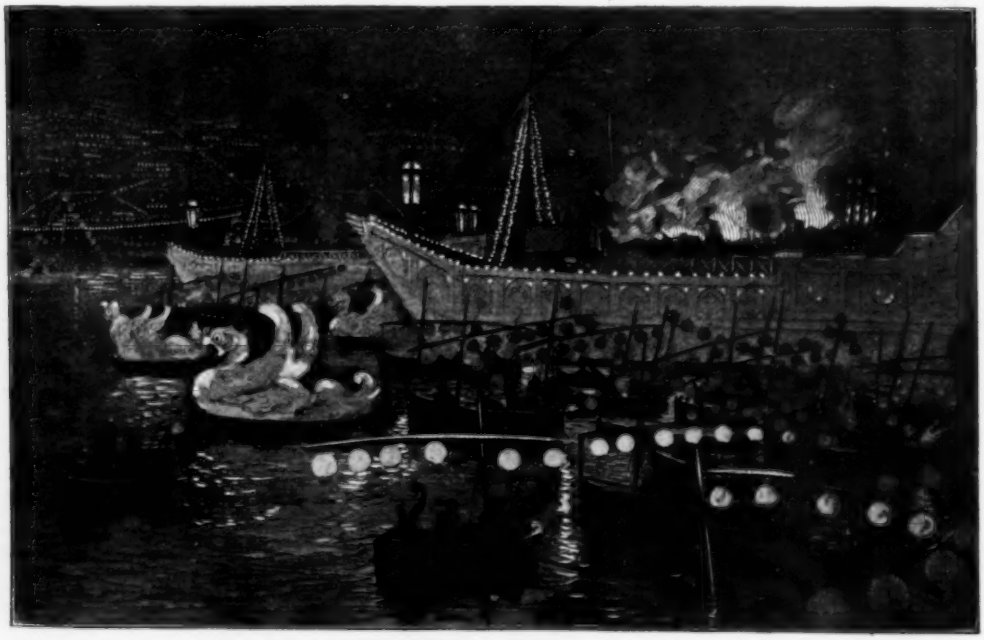
The fear that skirts would be likely

The cord, of course, can be length-

A NIGHT FETE AT MONACO

One of the most brilliant episodes accompanying the opening of the oceanographic museum at Monaco was a beautiful water pageant, the theme of which was the arrival of Hercules Monechos in the roadstead.

The whole stretch of water and the steep hills of the principality of Monaco were brightly illuminated, as were the floats in the pageant. The central float was a huge galley, which carried



Night Water Scene at Monaco

the famous singer, Ruffo, who impersonated Hercules Monechos. Another galley of the same size, and several smaller floats, formed in the shape of dragons and swans, made up the procession. Hercules Monechos chanted a salute to the earth, a chorus making echo.

The magnificent museum is to be devoted to marine zoological research. It was erected by the Prince of Monaco, and its inauguration was attended by representatives from the different European governments and the principal scientific societies.

IRRIGATION IN MEXICO

The Mexican government is now planning to utilize the waters of the Nazas river by the erection of a dam and irrigation work which will cost in the neighborhood of $6,000,000. The Nazas river rises in the northwestern corner of the State of Durango, flows south and east 225 miles, and is finally lost in the Laguna district, near Torreon. About 35 miles to the south of the source of the Nazas, and in the same range of mountains, the Sierra Madre, the Tepehuanes river takes its start, and flows in the same general direction for 60 miles. It is then joined by the San Tixco, while a fourth river, the Rio de la Palmas, is formed by the junction of the Tepehuanes and the San Tixco, and flows to the northeast for 50 miles, emptying into the Nazas. The territory drained by this system of rivers, with its numerous small streams, is over 20,000 square miles.

At certain seasons of the year all these rivers are without water, but during the rainy season the upper parts

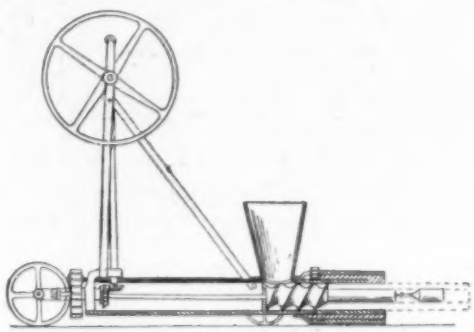
turns of fine silk thread. After the ing 26,544 miles of road so operated.

of the Nazas have an abundance of water for irrigation purposes, and it is to save this water for use in the dry season that the dam is to be constructed. It will probably be located in the San Fernandez canon, 40 miles above Torreon.

JOINTLESS CEMENT PIPE

A machine that makes continuous, jointless cement pipe is shown in the accompanying drawing. The cement is poured into the hopper, and from this is forced backward by a revolving screw, which drives it around the core. The core, which is connected with the screw, rotates with it, and the cement pipe is deposited in the ditch as fast as it is formed, the machine moving forward as rapidly as the pipe is made. Trailing behind the main core is a funnel-shaped attachment which gives the pipe an inside finish.

The power for turning the screw and for propelling the machine forward is gained by turning the large wheel. It

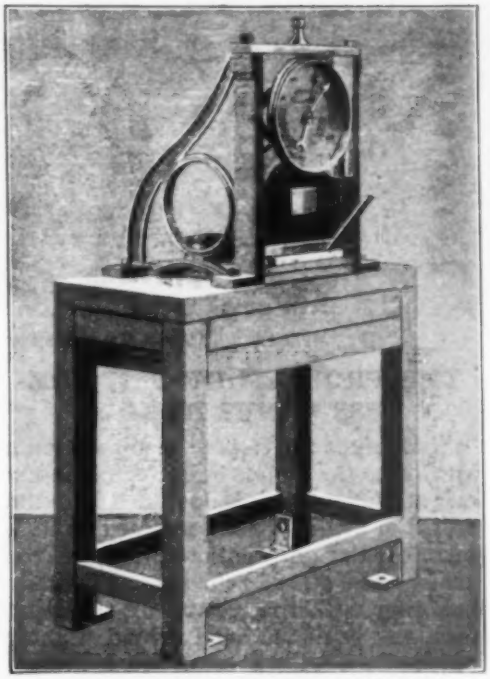


Continuous Cement Pipe-Making Machine

is claimed that 800 ft. of small pipe can be made and laid in a day.

MEASURING FORCE OF BLOWS STRUCK BY BURGLARS

M. Bertillon, the famous inventor of ways and means for making the criminal's life precarious, has added a new device to his collection in this curious apparatus for recording the amount of force represented by marks left by burglars' tools on wood.



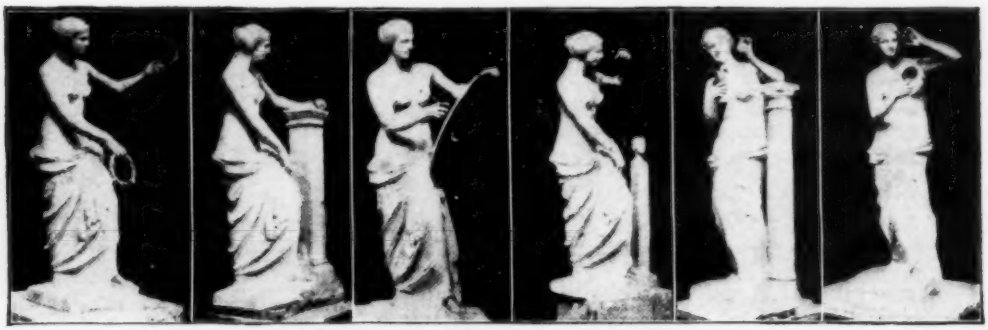
New Evidence Gatherer in Crime

The apparatus consists of two dynamometers, which, placed at right angles, are used to register pressure and horizontal traction. A piece of wood on which a burglar's tool has left its mark is brought to the machine for measuring and a similar piece of wood is provided for the test. The test piece of wood is placed in the machine and the marks on the original piece of wood are reproduced upon it by means of a tool like that used by the thief, the amount of force required to make the marks being registered by the apparatus.

M. Bertillon claims there are occasions when it may be highly advisable to know the exact amount of force used by a burglar.

¶A million bales of cotton are used every year in the manufacture of automobiles.

¶France leads the world as an exporter of automobiles, with the United States second in rank.



Different Conceptions of the Arms of Venus de Milo

THE PROBLEM OF THE ARMLESS VENUS DE MILO

Ever since the famous armless statue known as the Venus de Milo was found on the island of Milos in 1820, the world of art has tried to solve the mystery of the original position of the arms. The statue represents a woman standing with the weight on the right foot, and with the head turned slightly to the left. Both arms were broken off near the shoulders, leaving just enough to indicate the general direction in which they were extended.

At a recent meeting of well known artists and sculptors in London, several copies of the famous statue, with arms provided, depicting the ideas of the artists as to the position of the arms, were shown. Six of these are here illustrated, the second and third being the most popular of the conceptions.

NINETY TONS OF SALMON

This illustration shows part of a pile of red salmon that, although weighing 90 tons, was cleaned, canned, and cooked within a few hours after the photograph was taken. The huge pile of fish was brought in at Kogging, Alaska, one of the many fishing stations of the Bristol bay district.

Where Fishing Is Good

The fish are cleaned and placed in the cans by machinery, and cooked in steam at 220 deg. F. for 45 minutes. A small hole is then punched in each can to allow the gases to escape, the

holes are soldered up, and the contents are cooked for an hour more in steam at 240 deg. F. After the cans have cooled they are given a coat of lacquer to prevent rust, then receive the labels, and are ready for shipment.

AN ATTRACTIVE RESTING PLACE

When real estate agents wish to "boom" some new tract which has the disadvantage of being far from the center of town, they usually spend a good deal of money in beautifying it. The idea is that people will be glad to ride 15 minutes longer on the cars if their destination is some palm-bordered place with paving and street work in perfect shape.

In addition to this, a certain Los Angeles firm has conceived the idea of placing highly ornamental structures at each corner in the tract. They are made of concrete and rough timbers, while the roofing is of tiles reminiscent of the California missions. The effect of the little barred niches is that of a wayside shrine such as are found in the Old World, but the practical feature of it is that it affords a comfortable resting place while waiting for the street car and this is quite appropriate as a suburbanite spends much of his time on the corner waiting for the cars.

SPANISH RECRUITS KISSING MILITARY CROSS

When Spanish recruits join the army they have to file before the colors of

Standard and Sword Form Cross

their regiment and kiss the sword held against the standard. The upright standard with the sword held against it forms a cross. The illustration shows recruits being sworn into the army in Madrid.

Resting Spot a Suburban Attraction

PROPOSED MOTOR-SLEIGH FOR EXTERMINATING WOLVES

A correspondent of the Graphic, London, suggests the use of automobile sleighs with bodies enclosed with strong wire cages, for hunting wolves in eastern Europe, especially in Russia. The animals abound there and exact annually a terrible loss of human life, besides killing domestic animals in great numbers. It is pointed out that hunters with this equipment can make dashes into the wolf infested country and shoot hundreds of them without danger.

Fighting the Wolves

Some figures from Russia will give an idea as to the extent of the ravages of the wolf. In one year alone, within a single district of 20,000 square miles, wolves destroyed 1,800 horses, nearly 16,000 sheep, over 17,000 oxen, and large numbers of other animals. In addition to this, 161 human beings were killed and eaten. In Hungary wolves are the scourge of winter, filling the whole countryside with terror and apprehension. There the tireless hordes of wolves wage a constant war against man and all his belongings.

IMMENSE OIL RESERVOIR BURNS

A large concrete reservoir owned by the Standard Oil Co. near San Pablo, Cal., and containing about 300,000 bbl. of oil, caught fire recently, and after burning 17 hours, in which time only 18 in. depth of oil had been consumed, exploded. The burning oil poured over the sides of the reservoir and spread over the surrounding country. Trenches, which had been hastily dug for just such a contingency, proved entirely inadequate. The oil spread along the tracks of the Atchison, Topeka & Santa Fe tracks for a distance of five miles.

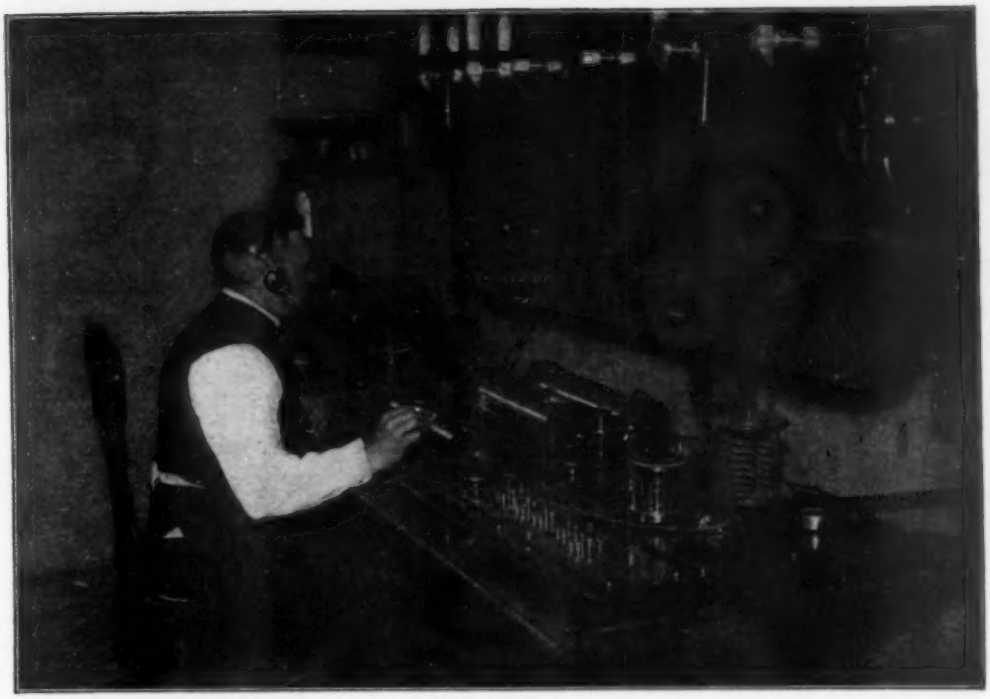
Practically all of the oil in the reservoir was blown out by the explosion, which was caused, it is believed, by the boiling water collected in its bottom.

AUTO AS FRUIT-VENDING VEHICLE

A fruit vender in Berlin owes his success to the fact that he peddles his wares from an automobile. The idea of an itinerant vender of fruit owning an automobile was a sufficient novelty to draw for him three or four times as much trade as would have been forthcoming were his vehicle an ordinary pushcart.

Auto Fruit-Vending Machine

¶An American firm is trying to secure a concession to build a system of elevated railway in Pekin.



Dr. Frederick H. Millener Tuning Wireless Telephone Instruments in His Workshops at Omaha, Neb.

A Pioneer in the Wireless Operation of Railroads

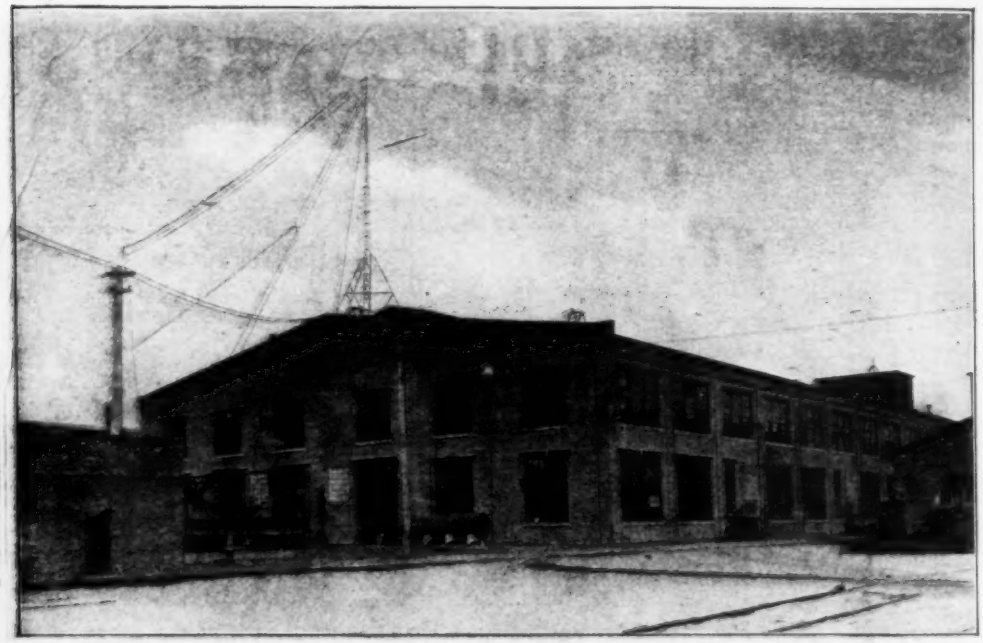
By HARRY F. KOHR

NEXT to its employment at sea the wireless system of communication may find its widest field of usefulness on our great railroad lines. Three years ago a series of experiments was begun in the Union Pacific shops at Omaha, and Dr. Frederick H. Millener, who has been in charge of the work, now states that a wireless system for communication between stations has been perfected. Success has likewise crowned efforts to communicate between stations and running trains.

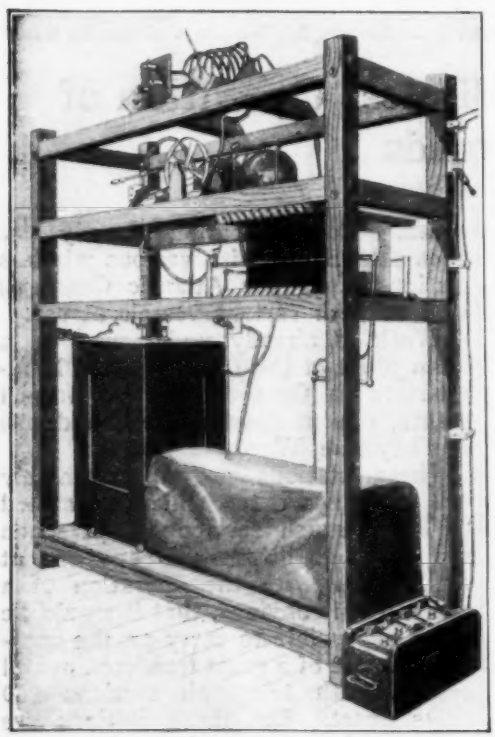
The Pennsylvania railroad has also been attempting to apply the wireless to railroad work, and has an experimental plant at Altoona, Pa. The mast in use for the tests is erected on a mountain, at a point 1,655 ft. above sea level, the receiving apparatus itself being 1,735 ft. above the level of the ocean. Communication already has been established with various wireless stations along the Atlantic Coast, as well as with various vessels at sea.

Work is already under way on a main plant at the Union Pacific headquarters in Omaha and two branch plants, one at Sidney, Neb., and one at Cheyenne, Wyo.

These stations are approximately 200 miles apart, too widely separated to be of much service except when the wires go down. To any one at all familiar with the operation of a railroad it is obvious, that it would be quite impossible to carry on the enormous traffic of a great transcontinental system with telegraph stations 200 miles apart. But these stations are only the foundation of a still greater and more intimate utilization of the



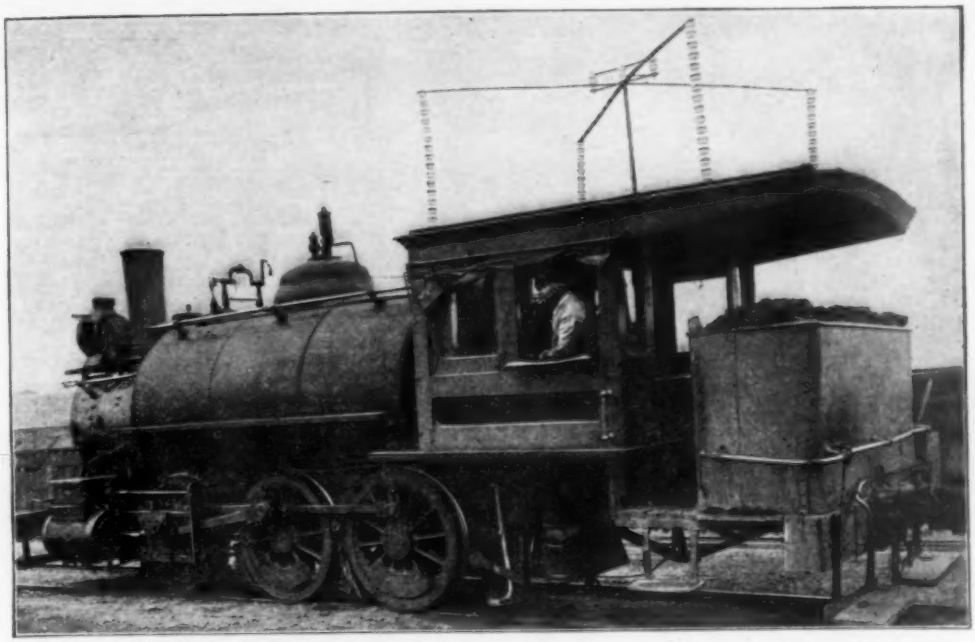
Boiler Shops of Union Pacific at Omaha Showing Aerials for Transmitting Orders to Trains by Wireless



First Wireless Set Made and Used for Experimental Purposes at the Union Pacific Shops

wireless system—communication direct between the dispatcher and the engineer.

While Dr. Millener was working out his system of wireless telegraphy, he also was applying the same efforts toward solving the problem of a wireless telephone by which it would be possible to communicate with running trains. The wireless telegraph was the foundation of Dr. Millener's scheme and he perfected that first. The wireless telephone is the superstructure. When the wireless telegraph stations are in operation the telephones will be ready to install, and thus there will be a double safeguard. But Dr. Millener wasn't quite satisfied with even a double safeguard, so he added an insurance policy, as it were, in the shape of an electric cab signal to work in connection with block signal system already in use. The cab signal also works by wireless electricity, showing the movements of the signals at each end of the block upon which the train is running. The cab signal was an incidental discovery while Dr. Millener



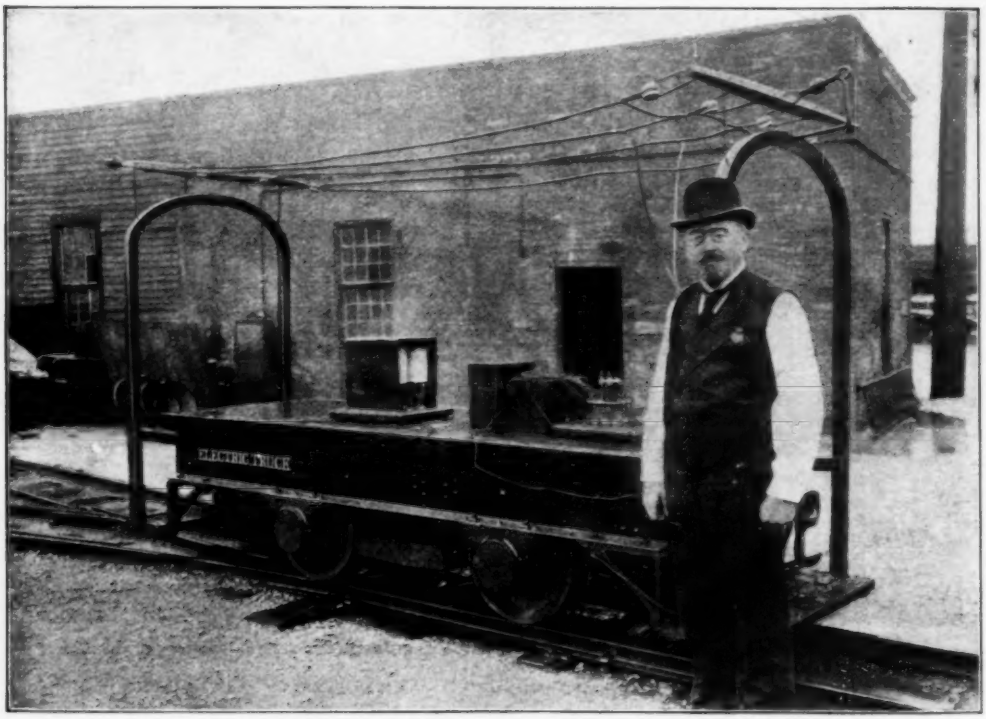
Engine Fitted for Receiving Wireless Orders—Receiving Instruments Are Located in the Cab

was working on his telegraph and telephone apparatus, and just for the present it is lying aside for future development.

As it will be worked in practical operation, the chief dispatcher at headquarters will issue his orders and send them by wireless telegraph to the division dispatcher. The division dispatcher makes up his charts and from his office telephones his orders to the engineer and the conductor. No chance there to run by a station where important orders wait, no chance for the operator to sleep while the night express thunders by to meet the limited between stations at 50 miles an hour and fill the news columns next day with the list of dead and injured. The dispatcher has every train right under his thumb and when the engineer disregards orders he is rounded up with a jerk. He can not plead misreading of orders. There is only for him the confession of gross criminal carelessness when something happens that shouldn't.

Dr. Frederick H. Millener, Whose Experiments with Wireless Are Attracting World-Wide Attention

In conducting his various experi-



A Truck That Is Operated by Wireless

ments, Dr. Millener has achieved some remarkable results. In his work he uses one of the largest transformers built for wireless use, 40 per cent greater in capacity than the Marconi machine at Glace Bay, Newfoundland. "Feeling" through space he has often caught messages from ships at sea, frequently he has talked with Brant's Rock, Mass., and on occasion has conversed with West Indian stations, with the station at Havana, and even with ships in the harbor of that city.

In the various experiments with telegraph, telephone and cab signals, Dr. Millener used an old switch engine, equipped with antennae suspended from insulated posts on the roof of the cab. While he sat in his laboratory in the boiler shop, one of his assistants rode on the engine and conversed with him either by telegraph or telephone. Finding that antennae were liable to damage on a running engine or train, Dr. Millener did away with them entirely, and his later experiments were conducted simply by insulating the metal roof of the cab and running wires from that to each of the devices. The "ground" is made through the wheels.

Beyond the bare facts, little information is given out about his discoveries, either by Dr. Millener or the Union Pacific. One reason is because these devices have a high patentable value. A second reason is that all of the devices are so intimately related with others that Dr. Millener has in mind that to tell the secrets of one might give a clue to others. In a general way it may be said that Dr. Millener's telegraph apparatus works upon the same general principle as the Marconi and De Forest systems, better described perhaps by saying that it combines the best points of both with a few good ones that he has brought out himself. The wireless telephone at first glance looks like the commoner styles of an Edison phonograph.

His experiments have attracted wide attention and hundreds of inquiries

about them come to him every week. Many inquirers make personal visits. But so closely does Dr. Millener guard his secrets, that he alone assembles his various machines. He leaves the details to his assistants. Seldom, if ever, are two parts of a machine made in the same shop, seldom does one workman handle two parts of the same machine at the same time. Most of his supplies come from abroad, some from Germany, some from France. Some he makes himself. Nobody knows as much about anything of the devices he makes as he does himself.

Just at present, Dr. Millener would rather talk about his wireless truck. Everything is wireless with him. In odd moments between his thinking spells he built a truck to run around the Omaha yards with power that he sent through the air from the boiler shop. He gave the first exhibition of it before the members of the Japanese industrial commission when they visited Omaha, and it was quite a success. Later on it may be put to practical use. Dr. Millener has his eye on a lot of dinky switch engines which he believes will look well on the scrap heap after his wireless truck begins to "kick" freight cars around the yards. Also, he believes, a lot of perfectly good copper is being used for trolley wires to run cars that might just as well be run by wireless. That will come later, too, so Dr. Millener affirms.

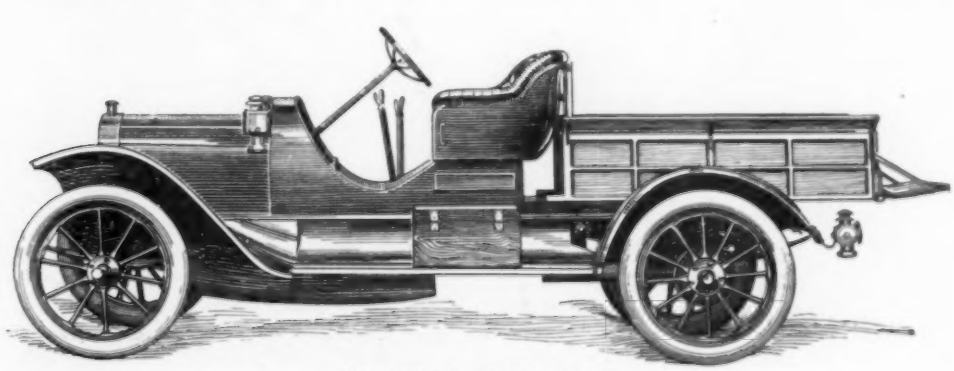
And then there are those miles and miles of electric light wires that clutter up our city streets, or go out of commission every time the conduits get full of water. They're useless, says Dr. Millener. Why not use wireless there, too. It's easy. See! And he turns a switch that lights Omaha's big auditorium with electricity that comes through the air from the army station at Fort Omaha, five miles away.

These are small things compared to Dr. Millener's wireless telegraph and telephone and his electric cab signal in practical railroad operation. With them in use only the tearing up of the track or its burial beneath feet of snow or some such unpreventable catastrophe can interrupt the operation of trains.

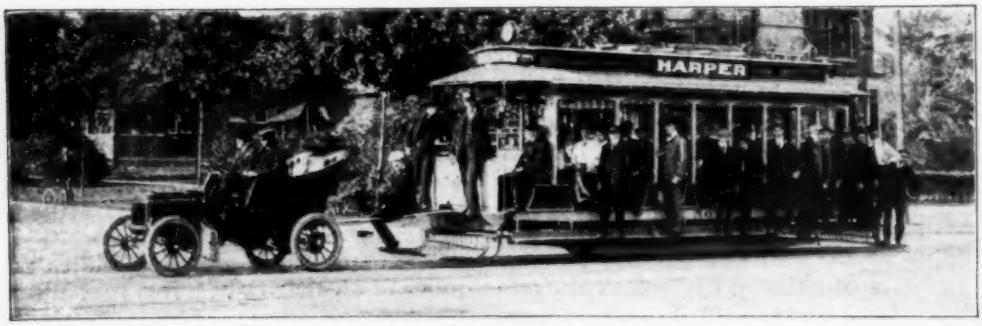
DETACHABLE EXPRESS BODY IN PLACE OF TONNEAU

A new and practical innovation in the automobile line is this express body, used in the place of the tonneau, with which it can be replaced in a few minutes when desired.

Such an arrangement fills a long-felt want on country estates to take care of the odd jobs of moving and delivering. It is used in moving goods from the city house to the country house, taking trunks to and from the station, etc.



Express Body Replacing Tonneau



Test of Tractive Power of Modern Automobile

THE PULLING POWER OF AN AUTOMOBILE

Proof of the pudding is always in the eating—and of the automobile in the "stunts" it will do. Much has been said about the lack of tractive power in the modern automobile, but demonstration seems to be furnished, in the accompanying photograph, of the ability of one small car, at least, to make itself useful in this department. A light machine recently pulled a "dead" street car the full length of a Detroit thoroughfare, with extra load beyond its seating capacity. In the same city another car has been used to shunt freight-cars about on yard tracks. It is probable that no great demand will ever exist for this sort of service from motor cars but, in emergencies, they are quite as useful as horses and far more readily handled.—Contributed by Barry Newcombe, 6109 Monroe Avenue, Chicago, Ill.

COSTLY TORPEDOES LOST DURING PRACTICE

The establishment of a proposed torpedo practice range at Bournemouth, England, was opposed recently by steamship companies and hotel proprietors, who claimed that the practice might ruin the season at the nearby resorts. It was made plain, however, that the torpedoes used in practice have merely dummy heads, not ones filled with explosives. The loss of torpedoes is a subject which has caused the admiralty much concern. Within a short time 10 of them were lost from

Marine Monster Cast Up at Southsea, England

English battleships, cruisers, and torpedo-boats, the value of which exceeded $25,000. The illustration shows one of these torpedoes, which went astray during practice, cast up on the shore at Southsea.

AEROPLANES PROVIDED WITH GUNS

Experiments are now being made in France with aeroplanes as offensive weapons, guns being mounted on the machines. Latham is fitting a rapid-fire gun on one of his Antoinette machines, and believes that as he operates his machine mostly with his feet, he will be able to aim and fire the gun himself.

In one of the experiments on the field at Chalais Meudon an aviator flew to a height of more than 1,000 ft. with a gun mounted on the frame of his machine. A new type of aeroplane carrying two machine guns is also being tested out.

RIDING VEHICLE FOR COTTON PICKERS

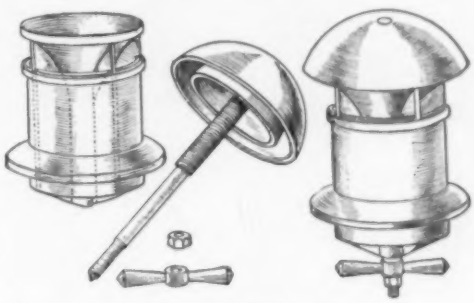
One of the latest patents in cotton harvesting machines is not, in reality, any more of a harvesting machine than is a hayrack. It is, in fact, a low, three-wheeled vehicle on which a cotton picker may ride while performing his task. It consists of a frame made entirely of steel and iron, provided with a seat for the picker and a platform on which the gathering bag rests. The person picking cotton rides upon the vehicle as it is drawn between the rows of cotton by a horse or mule, and deposits the cotton he picks by hand into the bag. A brake, operated by the feet, brings the vehicle to a stop opposite the cotton stalks.

A Cotton Picker's Vehicle

Among the advantages claimed for the vehicle is that it makes cotton picking easy and saves the back, which results in quicker picking.

NEW VENTILATOR FOR SMALL BOATS

A new type of ventilator for small boats has been placed on the market. It consists, as may be seen from the illustrations, of a cylindrical body with a mushroom shaped top. The inside of the body is provided with four guide blades. The ventilator acts as a combined intake and extractor. The air is taken in at whatever side happens to be facing the wind and passes down past the guide blades to the cabin below. There is a suction on the side of the ventilator away from the wind and through this air from the cabin is drawn out. The dome top has a thread cut on its spindle and in case of bad weather can be screwed down over the ventilator, making a watertight joint and preventing possibility of leakage.

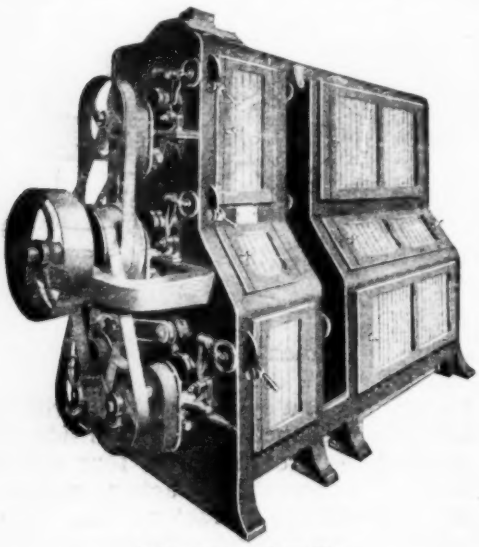


Detail of Ventilator

¶A short branch of the Great Western railroad of England has been provided with a regular passenger service of rail automobiles.

SMALL, COMPLETE FLOUR MILL

A self-contained flour mill occupying a floor space of only 8 by 4 ft. with a height of 6 ft. and a total weight of



Roller End of Flour Mill

5,800 lb., capable of turning out from 25 to 50 bbl. of flour per day, is a recent innovation in flour-making machinery. It is said that the flour made by the machine compares favorably with the best product of large mills.

The scalping, grading and dressing is done by four silk-covered centrifugal reels, ingeniously divided and arranged so as to take care of the ground stock. Each of these dressers is provided with a brush which keeps the silks clean. The entire plant, including the engine, wheat cleaners and mill, can be easily operated by one man.

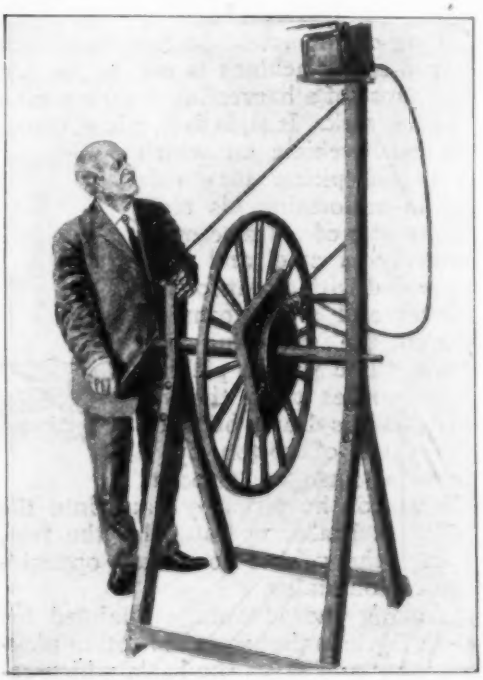
DISTINCTIVE TYPES OF UNITED STATES NAVY MOTORBOATS

The recognized marine term for boats driven by gasoline engines is "motorboat," but this name is too general for unqualified use in the U. S. navy. Consequently, the different types of such craft will bear the following distinctive names: The barge of a flag officer will be known as a "motor barge," service type launches built for heavy duty, and speed and semi-speed boats will be known as "motor boats," sailing launches with auxiliary power engines as "motor sailing launches," double-ended power boats, whaleboat type, as "motor whaleboats," power dingies as "motor dingies," and power dories as "motor dories."

DEVICE TESTS TAXIMETERS

The sealer of weights and measures in Washington, D. C., Col. W. C. Haskell, has devised an apparatus by which he tests the accuracy of taximeters. By attaching the flexible wire of a taximeter to the large wheel he can find out in 100 turns whether or not the taximeter is cheating the taxicab company or the passenger.

One hundred turns of the wheel represent a quarter-mile ride in a taxicab, and every taxicab in the District of Columbia must carry a taximeter tested by this machine.



Washington's Taximeter Testing Device

THE MAKING OF ARTS-CRAFTS LAMPS

By JOHN D. ADAMS

PART I

This is the first of a series of articles on lamps designed to be used in combination with mission furnishings and arts-crafts articles. These are the things most desired in furnishing homes of the present day, and a handy workman with some knowledge of tools can make and finish such pieces or articles necessary to harmonize with the surroundings.—THE EDITOR.

THAT really artistic lamps—portable ones for reading, pendant lamps for the porch, domes for the dining room, lanterns for the den, in fact all manner of lamps that are usually made from expensive leaded glass—can be made from paper, cardboard, and wood, may seem a trifle strange; but still stranger will it seem when it is stated that these results may be accomplished by almost anyone who has ever used a saw, plane, and pocket knife, and is still in possession of a fair amount of patience. But, you will say, it is quite impossible that from cardboard and colored paper a shade can be produced that will be as beautiful as one of leaded art glass.

Of course, there is a difference, but it is very much less than would be imagined, and is hardly noticeable when the shade is illuminated. During the day time the colored paper is quite attractive, whereas the colored glass is very dull and often decidedly unattractive when not illuminated. But once more, you will object that the cardboard shade must be very frail. True enough, they will not stand as much crushing as a metal frame, but then shades usually break by falling, and falling can not harm our cardboard-paper shade, so that under ordinary conditions the latter is safer. However, be this as it may, cardboard formed into angles, properly braced and connected, becomes very rigid. Like a roof truss, its strength lies more in its shape than in the amount of material employed.

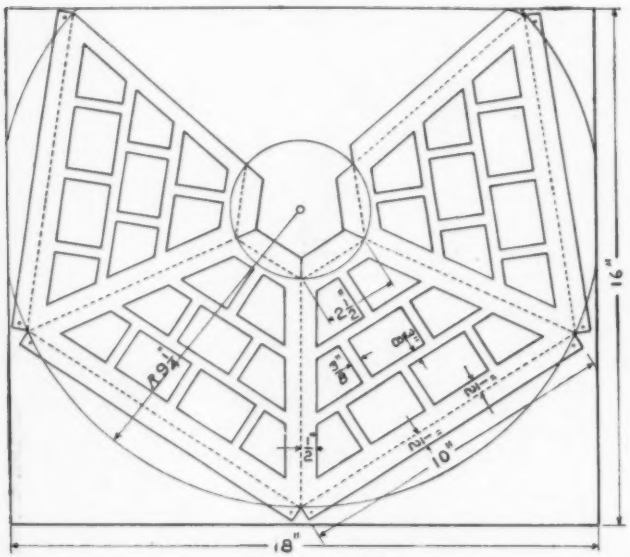
To restate our original proposition:

One-Light Portable Lamp

Anyone with sufficient patience to avoid all hurry can, at home, at an almost negligible expenditure, produce a great variety of lamps, that will, nine times out of ten, be mistaken for the product of a professional rather than of an amateur. In this line of work the results are invariably delightfully surprising.

Handicraft work is becoming more popular every day, and outfits for metal etching, perforated brass work, hammered copper, and various other crafts, are now supplied by the large department stores. But none of these hobbies find such a wide or important application in the home as the subject of lamps; and after the reader has become familiar with the general system of construction, and has gained the confidence that comes with some little actual experience, the work will be found

intensely interesting. The effect on the eyes of a properly shaded lamp, the artistic effect in the combinations of various colors, the opportunities presented for individual ingenuity in adapting the color scheme to that of the room, will all be duly appreciated as the work proceeds. The largeness of the field will also prove attractive to the amateur craftsman. A hanging lantern for the porch, a chandelier for the living room, a dome for the dining room, a pair of bracket lamps for the den, a portable for the library table,



Layout for Shade

and shades for a drop light here and there about the house, will all be required.

Through all this work the general method is largely the same, so that after a few lamps have been made, the enterprising amateur will find ample opportunity to exercise his or her ingenuity in the way of adopting and combining such attractive features observed in other lamps that have struck the fancy, and finally will have the satisfaction of designing and constructing a lamp entirely from original ideas.

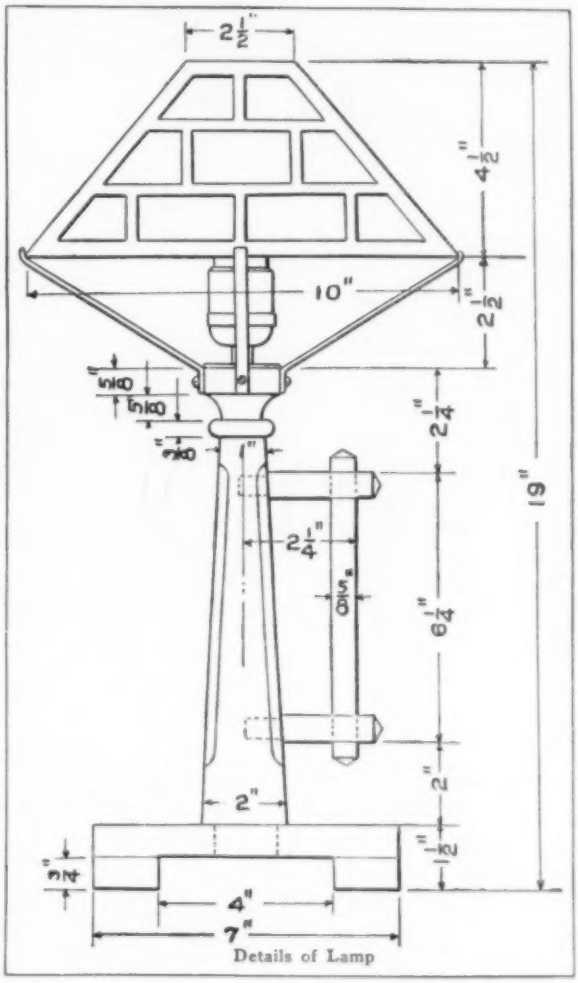
About all the tools necessary are those required for the little carpentry work in connection with the stands. A good sharp pocket knife with a large handle should be provided, and its point must always be kept particularly sharp, else the edges of the cardboard will be irregular and frayed. A roll of black passe-partout tape, some drop-black paint, a bottle of liquid glue, a box of brass paper fasteners, are all the necessary supplies required besides the cardboard and colored papers.

A One-Light Portable Lamp

Let us first consider a one light portable lamp—a lamp suitable for a desk or small table. The first thing to do is to lay out the pattern for one of the sides of the shade, which should be done on a flat and rather heavy sheet of paper, after which it should be carefully cut out with a sharp knife. A sheet of cardboard, 16 by 18 in. should now be procured. The reader should be cautioned against trying to work with too heavy a grade of cardboard. Select a moderate weight and test it by lightly scoring one side with a knife and bending it to a right angle, the knife mark always being on the outside of the bend. If the cardboard is cheap and short-fibered, the fact will be evident when so tested. Place the paper pattern on the cardboard and mark it off with a sharp pencil. Then move the pattern over one space, that is, move it until one edge exactly coincides with the outer pencil line of the first position, and mark off again, continuing the operation until the fourth and last side has been marked off. In this manner we obtain the complete pattern on our sheet of cardboard as shown. The dotted lines indicate those that are to be scored with the knife for bending, and the full lines those that are to be cut clear through. It is advisable that the cutting be done over a hardwood board, and in making the first pass with the knife do not press

too hard, as the hand or straight edge is more apt to slip at this stage than when the cut has reached some depth. Any rough or torn edges should be smeared with glue and sandpapered when dry. When all the cutting has been done, place the line of bend directly over the sharp edge of a table or board and the straight edge over that portion remaining on the table, then bend gradually all the way along. The last edge of the fourth section has a connecting strip which should be covered with glue and then fastened to the first edge of the first section. The extra strips at the top and bottom should finally be bent inward to a horizontal position and fastened with a paper fastener at each corner. The corners of all bends should be reinforced with passe-partout tape. The entire framework is now to be painted a dull black, which, in anything but broad daylight, will be invariably mistaken for the usual iron work. Select some paper of the desired shade and color, and before attaching it, try the effect after dark by bending it around a light. Sometimes two or even more thicknesses may be necessary. Generally, in a tapering shade like this, the upper portion, which is nearer the light, appears brighter than the lower portion, in consequence of which a very pleasing and attractive blend from a lighter to a darker shade is obtained.

In making the stand, prepare the square base first, and then glue on a square block at each corner, taking due care to keep all corners sharp and square. An inch and a half square hole should be cut in the center. The main post, which will require some little care, can be worked out in the rough by means of a small scroll saw. When the top and the proper taper have been formed, work out the tenon on the lower end to fit the square hole in the base, after which cut the small mortises for the handle, and bevel the edges. The making of the handle will be largely a matter of penknife carpentry. Make the two horizontal pieces first and fit them to the main post, after which carefully mark off the position of the handle proper, where a notch should be cut in each to half the depth. After notching out the vertical piece of the handle in a similar manner, the entire handle may be fitted together and made fast with glue. A hole should be drilled through the center of the main post for



Details of Lamp

the wire, and four pieces of light brass or iron are to be procured and fastened to the top of the post to support the shade. If a sufficiently long bit is not at hand, take the stand to the nearest electrical shop, have the hole bored, and the socket, plug and cord all attached.

CURIOUS HOUSE WITH DOOR IN ROOF

One of the most curious dwellings in or around Cleveland, Ohio, is this cottage perched on the side of a hill above a stream which runs through a valley 100 ft. below.

A House Entered from the Roof

The entrance to the cottage was formerly on the other side, but the owner found the hill to be too steep to be accessible to many visitors. Therefore, he cut a hole in the roof, raised a section of roof above it, and inserted a door. A staircase leads from it into the living room.

¶The automobile industry is so rapidly using up the supply of hickory that a new wood must soon be found for spokes, rims, etc.

A GREAT SALT MINE IN ROUMANIA

This illustration shows the main shaft of a great salt mine at Slaniku, Roumania. Its present output is 78,500 tons a year, but were this to be increased to 100,000 tons the mine would not be exhausted for 200 years, as the deposit available is still about 20,000,000 tons.

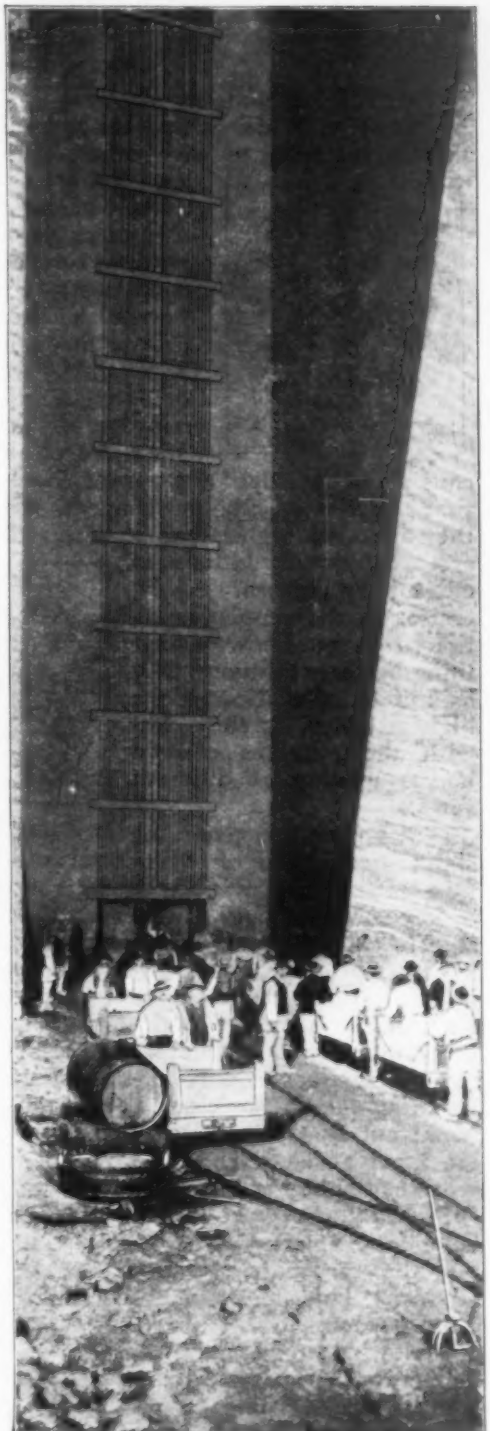
The salt of this mine is more or less colored by impurities, and has a stratified appearance. The floor of the mine is lowered about 6½ ft. each year.

FIVE-LEVEL SUBWAY STATION FOR NEW YORK

The latest plans by the New York Central & Hudson River railroad to connect its Grand Central terminal with the several present and proposed rapid-transit subways will mean a 5-level subway connecting station. The five levels underground will be those of the existing Interborough subway, the Hudson tunnel extension now under construction, the New York & Long Island tunnel, and the Broadway-Lexington Ave. subway, soon to be started by the public service commission. The latter will be double-deck at the point of the station, thus making the five levels necessary.

CONCRETE BLACKBOARDS FOR SCHOOLS

Concrete as a material for school blackboards is said to be a great improvement over any other kind of blackboard material, even slate. The foundation of the new kind of board is concrete applied to an ordinary brick or wire-lath wall. The finish is liquid concrete. It gives a smooth surface, which consumes very little chalk, and eliminates chalk dust to a great extent. Its most important feature, however, is the fact that it presents an absolutely dead finish, without reflection, making it possible to see what is on the board from any angle of the room.



Courtesy Illus. London News

Roumanian Salt Mine

Clock-Hand Problems

By JAMES ARTHUR
Author of "Time and Its Measurement"

SIMPLE calculations showing the times at which clock hands bear certain relations to each other, such as being together, forming a right angle, a straight line, or equal angles from a line drawn through XII and VI etc., have a certain fascination. They are often considered "puzzles" and appear sometimes in the weekly newspapers, but they are much higher than puzzles, and are, really, calculations in elementary algebra. As exercises in the simpler equations I do not know of anything better; still more, they lead up to calculations of the highest order, as they deal with the relations of two bodies moving at different speeds.

FIG. 1. 11. HANDS FIVE MINUTES APART.

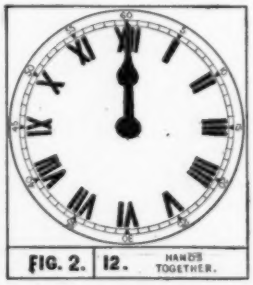


FIG. 2. 12. HANDS TOGETHER.

Clock hands give the simplest example of differential motion as they move in the exact ratio of one to twelve and thus form a first step in calculations of moving bodies, leading up to the complicated motions in the solar system. Suppose that in an equinoctial year we had just 12 lunar months; then calculations relating to new moons, quarters, etc., would be as simple as the clock hand problems; but as the year and the month are incommeasurable, that calculation requires the higher mathematics.

Figure 1 shows 11 o'clock with the hands five minutes apart. What time after 11 would bring the hands together? This looks like a childish question, but by assuming that we do not know and formally making the calculation a clearer conception of the matter may be attained.

Let X equal the number of minutes the minute hand must move. Then X — 55 minutes will be the distance the hour hand must move. The hour hand must move 1/12th of X, or $\frac{X}{12}$ therefore we have

(1) $$X - 55 = \frac{X}{12}$$

Multiplying both sides by 12 we have

$$12X - 660 = X$$

Carrying the minus number to the right it becomes plus giving

$$12X = X + 660$$

Bringing X to the left it becomes minus giving

$$11X = 660$$

Therefore $X = \frac{660}{11} = 60$ minutes, so the hands come together at 12 o'clock, Fig. 2, which we knew before, but we have tested the formula.

At what time after 12 would the hands form a right angle? Inspection shows that it must be more than 15 minutes past 12. We cannot guess this answer, but as shown in Problem 1 we get the equation

(2) $$X - 15 = \frac{X}{12}$$

$$12X - 180 = X$$
$$12X = X + 180$$
$$11X = 180$$

$$X = \frac{180}{11} =$$

16 4/11 minutes past 12 as in Fig. 3.

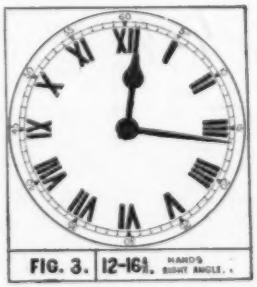


FIG. 3. 12-16⅓. HANDS RIGHT ANGLE.

At what time after 12 would the hands form a straight line? Again, inspec-

tion shows that it must be more than 30 minutes past, so we get the equation

(3) $$X - 30 = \frac{X}{12}$$

Solving as in Problem 1 we get X = 32 8/11 minutes past 12 as in Fig. 4.

You can make as many of these problems as you please, such as:

When would the hands come together after 3? What time after 4 would the minute hand pass the hour hand 5 minutes? What time before 12 would the hands form a right angle? If you have worked all these carefully you must have noticed that in all cases you have multiplied by the improper fraction $\frac{12}{11}$.

Secondly, the number so multiplied has always been the number of minutes which would give the required position of the hands if the hour hand had not moved. Now test this "arithmetical rule" on Problem 1. If the hour hand had not moved, the minute hand would have come up to it in 55 minutes, so $55 \times 12/11 = 60$ minutes as we have found by algebra. Problem 2 treated in the same way would give a right angle at 15 minutes past, so we have

$15 \times 12/11 = 16\ 4/11$ minutes

which is the correct answer. Similarly Problem 3 would be

$30 \times 12/11 = 32\ 8/11$ minutes,

correctly, as in Fig. 4.

We have now come to problems somewhat different, which we may call balanced hands. Let us suppose a vertical line drawn through XII and VI and consider various places where the hands would form equal angles with this line.

FIG. 6. 8-18⅛ HANDS BALANCED.

At what time after 11 o'clock would the hands balance? Inspection shows that the minute hand must fall short of 5 minutes as much as the hour hand passes 55 minutes; that is, the hour hand must pass XI just as much as the minute hand falls short of I.

As before, let X equal the time; then the hour hand must pass XI one-twelfth of that, or $\frac{X}{12}$, but 5 minutes minus X must also equal this, so we have

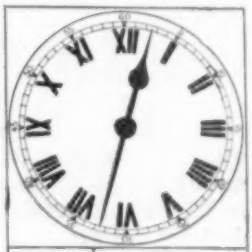


FIG. 4. 12-32⅛ HANDS STRAIGHT LINE.

$$\frac{X}{12} = 5 - X$$

$$X = 60 - 12X$$

bringing minus 12X to left it becomes plus and gives

$$13X = 60$$

$$X = 60/13 = 4\ 8/13$$

minutes past 11 as in Fig. 5.

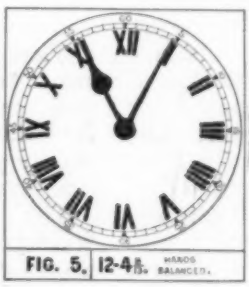


FIG. 5. 12-4⅛ HANDS BALANCED.

In painting watchmaker's signs the artist sometimes "balances" the hands as in Fig. 6, but he generally fails to get them right, so let us see when the hands would balance after eight. As the time must be less than 20 minutes we get an equation similar to Problem 4

(5) $$\frac{X}{12} = 20 - X$$

$$13X = 240$$

$$X = \frac{240}{13} = 18\ 6/13 \quad \text{minutes past eight as in Fig. 6.}$$

Note the constant fraction 12/13 in these balanced problems, so we can get an arithmetical rule here also. Assuming that the hour hand stands still, the hands in Problem 4 would balance at 5 minutes, so we have $5X \times 12/13 = 4\ 8/13$ minutes as by algebra.

Applying this rule to Problem 5 we have $20 \times 12/13 = 18\ 6/13$ minutes which is correct. As many of these balanced problems as you wish may be solved.

When would the hands balance after 3?

When would they balance after 9, 2, etc?

For simplicity I have given the time in minutes, but if answers are extended to seconds we will still have fractions.

To reduce 6/13 minute to seconds we have

$$\frac{X}{60} = 6/13$$

$$13X = 360$$

$$X = 360 = 27\ 9/13 \text{ seconds,}$$

making the answer to Problem 5, 18 minutes, 27 9/13 seconds past eight as in Fig. 6. Extending the answer as a decimal we get

$$X = \frac{360}{13} = 27.692307\dot{6}9230\dot{7}$$

seconds. This is to the ten-billionth part of a second, but there is still a fraction more, for 769230 recur in the same order, indefinitely, thus forming an endless decimal fraction, sometimes called a "mixed circulator." This is caused by the interesting fact that we are dealing with relative motions, the hour hand always moving at 1/12 the rate of the minute hand.

While this short article gives only a few simple examples, I think they are enough to show that clock hand problems constitute a charming and instructive exercise in elementary science.

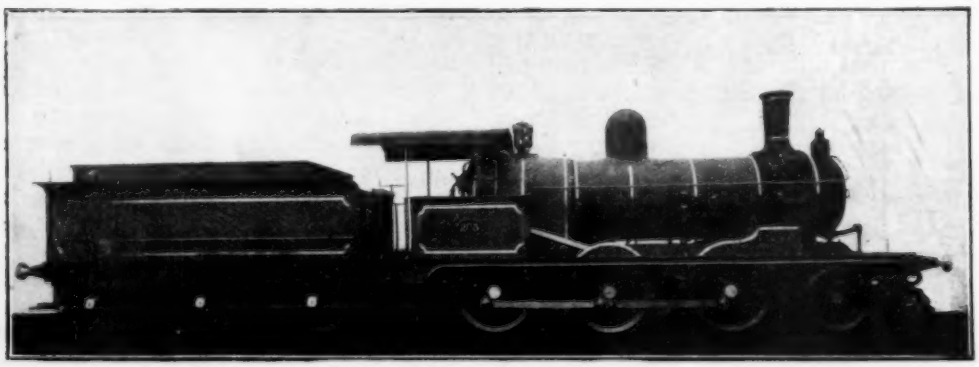
FREIGHT LOCOMOTIVE OF INDIA

This locomotive is used for freight-hauling on the Great Indian Peninsula railway. It is of the English Mogul type, with inside cylinders. The driving wheels are 4 ft. 6 in. in diameter. The cab is of an open type with a canopy overhead to protect the engineer and fireman from the sun and rain. There are several features in the exterior appearance of the locomotive that may seem curious to people familiar with the American types. A footboard, for instance, runs the whole length of the tender, and its forward end forms half of the step leading into the cab. The whistle also has an unfamiliar appearance.

ACCIDENT-PREVENTING DEVICES DEMANDED BY ITALY

That the Italian government is making a serious attempt to provide ways and means of preventing accident to its industrial workers is evinced by the money prizes offered in order to stimulate the invention of such appliances.

The prizes just offered include $2,000 for a paper on electrical earth connections; $800 for a transportable apparatus for slipping belts on pulleys; $800 for slipping a belt on a driving pulley in motion; $2,000 for the discovery of measures for eliminating the dangers of anthrax in tanneries, and $400 for a device to protect workmen on cold-rolling and drawing machines.

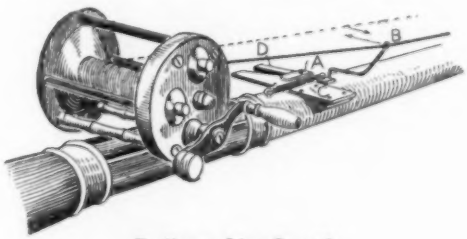


Freight Locomotive in British India

SHOP NOTES

How to Make a Reel Line Guide

A great many fishermen have trouble with their reels in casting owing to the back lash or the reel running too fast for the unwinding line. A little homemade device illustrated herewith will enable the fisherman to reel his line so it will run out smoothly. It is constructed of the clapper from an old electric bell, together with the bar and pivots to which it is attached. The striker or ball on the end is removed and the wire bent into a ring. The device is secured to the rod in front of the reel as shown. A spring is attached at C to draw the wire on one side. Thread the line from the reel through the ring at B and on to the end of the rod. In use, grasp the rod with the left hand and manipulate the lever D



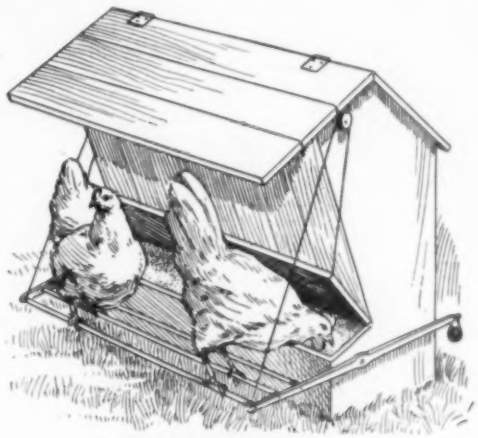
Reeling a Line Smooth

with the left thumb. The line can be wound on the reel evenly, ready for the next cast.—Contributed by A. G. Mason, Chicago, Ill.

A Chicken Feed Hopper

This hopper has some advantages that other feeding devices do not have. The automatic lid prevents the food getting mixed with dust and dirt. The fowl can open the lid at any time for eating and the food will only come in the manger as it is used. One filling of the hopper will supply food for two or three days. The fowls soon learn to use the feeder.

The hopper is 8 in. wide, 2½ ft. high and 3 ft. long. The roof projects over

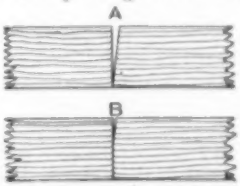


Chicken's Weight Operates Lid

the perch and hopper. The cords are attached to the lid of the manger and to the perch, running over pulleys fastened near the roof, as shown in the illustration. The perch is fastened on two cross bars pivoted to the ends of the hopper. The back ends of these cross bars are weighted so as to close the lid when no fowls are on the perch. The weight of one fowl will raise the lid.—Contributed by Warren Lewis, Butte, Montana.

Fitting the Ends of Two Boards

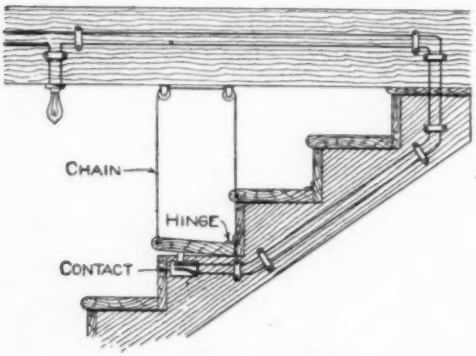
Many times in splicing boards the ends do not fit closely together as shown at A in the accompanying sketch. A simple way to remedy this is to hold them tightly together



and saw through the joint one or more times with a saw until they come together square as shown at B.—Contributed by Victor Metzech, Chicago.

Automatic Switch for Basement Lights

The electric basement light is many times forgotten and left burning when not in use, and sometimes allowed to



Steps Operate the Switch

consume current all night because some one did not turn the switch after arriving at the top of the stairs. Basements in stores are usually lighted in this manner and the electric lights are left burning many times by some clerk who is in a hurry and does not stop to turn the switch.

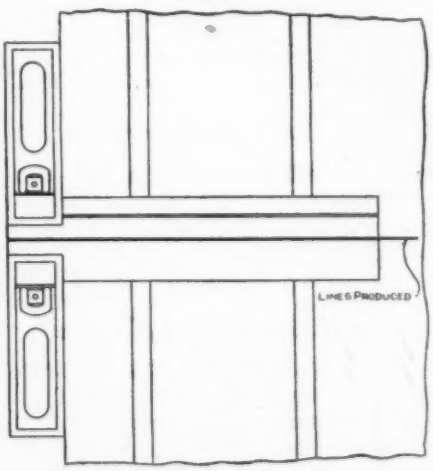
I constructed the device as shown in the sketch to take care of the electric light in my store basement. It would work automatically, turning on the current when anyone would go down the steps and turning it off when he came up. The main electric wires were connected up to a switch located near the end of one of the steps, about four or five steps down from the top. Two of the steps were hinged at the back and their outer edge fastened to a chain that ran over two pulleys screwed into a joist above. The chain was of such a length that when the front edge of one step was up the front edge of the other was down. When a person would go down the steps to the basement the lower hinged step would be pressed down last, thus making the connection for lighting the lamp. When going up the upper hinged step would be pressed down last thus breaking the connection and turning off the light.—Contributed by F. G. Christensen, Santa Rosa, Calif.

Keeping Paint Out of Oil Holes

When painting the automobile body and chassis be sure to stuff the oil holes with felt or waste before applying the paint. If this caution is not observed the holes will become clogged with paint which will prevent any oil reaching the bearing.

How to Prove a Try-Square

Try-squares of the removable blade type need occasional adjustment and where a standard square is not kept to prove them, they can be set by the method shown in the accompanying sketch, which will be found to be accurate enough for all but the finest kind of work. Remove the burrs from the edge of a planer table or any flat surface with a perfectly straight edge, and cover a strip, at right angles to the edge, about 1 in. wide and the length of the square blade, with a copper solution or powdered chalk. Place the beam of the square against the edge of planer and with a sharp scriber draw a line along the edge of the blade. Reverse the square as shown and draw another line close to the first and any



Testing the Square

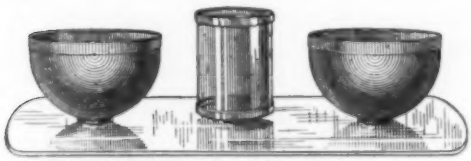
inaccuracy in the tool is apparent at once and can be corrected to a nice degree.—Contributed by Donald A. Hampson, Middletown, N. Y.

Oak Stain

An easy, and at the same time, a good way to stain oak in imitation of the fumed effect, is to boil catechu in the proportion of ¼ lb. to 6 lb. of water, after which cool and strain. Apply this to the wood, and when dry treat with a solution of bichromate of potash in the same proportion as with the catechu. Bichromate of potash alone in water will give a good stain. A solution of 2 oz. of pearl ash and 2 oz. of potash mixed in a quart of water makes a good stain. Potash solution darkens the wood, and when applied very strong will produce an almost ebon hue, due to what we might describe as the burning of the wood fiber.

Smoker's Set for the Engine Room

Procure a brass plate, two brass oil cans and one oil cup. Remove the bottoms from the cans so they can be used

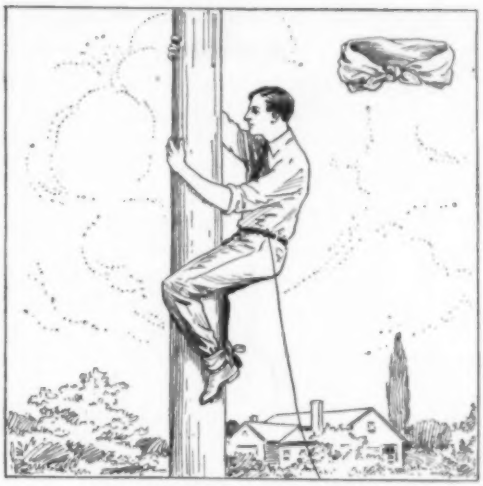


Cup and Cans Mounted

for covers and then fasten the cans bottom up to the brass plate, or they can be screwed or bolted to a piece of mahogany. Attach the oil cup in the same manner. When the parts are polished the set will be very odd and attractive. —Contributed by Maurice Baudier, New Orleans, La.

Easy Way to Climb Poles

When one wishes to climb a flag pole it will be found very hard to do so with the shoes on the feet. The simple way illustrated makes it easy to climb a pole. The shoes are taken off and a handkerchief with two opposite corners tied in a square knot as shown in the corner of the sketch, slipped over the feet and up around the ankles. In climbing the pole, spread

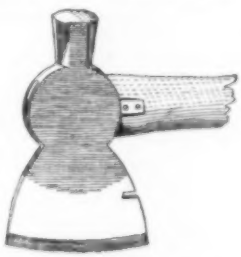


Ankles Tied Together

the knees apart, thus forming a grip against the pole with the insteps similar to a pair of pliers. A person can take long leaps with much ease in going up. The handkerchief is shaken off when you start down.—Contributed by John Blake, Franklin, Mass.

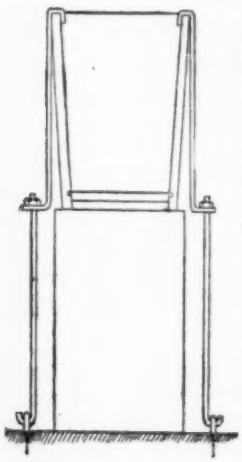
A Wedge for a Hatchet Handle

If a hatchet will not stay on its handle, take a piece of iron, $\frac{1}{16}$ in. thick, ½ in. wide and 3 in. long, bend a small portion of one end over at right angles and drill two small holes near the other end. Place this piece of iron between the handle and the hatchet with the end turned over on top of the metal part, then put two small screws through the holes into the handle. It may be necessary to make room for the wedge. This can be done by cutting a small groove in the handle with a chisel. The end turned over on the wedge should not extend over the side of the hatchet. This wedge makes it impossible for the hatchet to slip off the handle.—Contributed by Andrew Thome, Louisville, Ky.



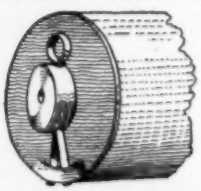
Clamp for Holding an Ice Cream Freezer

It is always harder to hold an ice cream freezer than to turn it, yet very few persons think of rigging up a holding device. Clamps can be easily made, as shown in the accompanying sketch, to hold the freezer on a box or block at a height which will facilitate the turning of the crank. The upper bars are made of ¼ by 1-in. flat iron, bent as shown, and a ⅜-in. hole drilled in the bottom end for a rod. The rods are long ⅜-in. bolts with their heads cut off, and a short hook turned up on that end. Two ¼-in. screw eyes are screwed into the floor to receive the hook ends of the rods. It is best to oil the threaded ends of the bolts after using the freezer to prevent the salt water from rusting them.—Contributed by F. C. Bachman, Sherman, Texas.



Preventing the Wear on a Cotter

Where a cotter is used to hold a washer on the end of a shaft and a revolving hub of a wheel runs against the washer the latter often turns with the wheel and in time wears the cotter off. To prevent this I locked the washer and cotter in the following manner. A cut was made through the washer about ¼ in. from the edge and about 1 in. long. The strip was bent up and when the washer was put in place the strip was then bent down over the cotter as shown in the sketch.—Contributed by Thos. L. Parker, Olaf, Iowa.



Cost of Repainting Automobiles

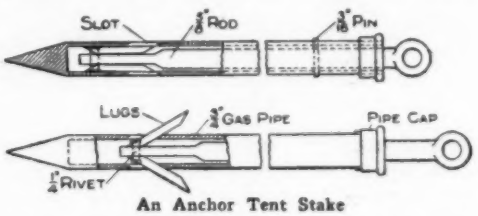
The average paint shop does not have data on the price to charge for repainting and varnishing automobiles. As this is a new line of work that has come to stay, the profit should not be cut, as is too frequently the custom on carriage and wagon work.

The following list of prices has been compiled by the American Vehicle, which represent the cost of work as charged by the regular automobile painters:

Revarnishing Limousines	$ 65.00
Painting and Varnishing Limousines	100.00
Burning off, Scraping and Painting up Limousines	125.00
Revarnishing Touring Cars	45.00
Painting and Varnishing Touring Cars	75.00
Burning off, Scraping and Painting up Touring Cars	100.00
Revarnishing Runabout Cars	25.00
Painting and Varnishing Runabout Cars	45.00
Burning off, Scraping and Painting up Runabout Cars	65.00

A New Metal Tent Stake

A novel home-made tent stake is shown in the accompanying detail sketch. If it is well made it is far superior to the straight wood or iron ones commonly used. The body is made of ¾-in. gas pipe and should be about 2 ft. long. Heat one end and draw it down to a solid point so that it will drive easily. Thread the other end for a pipe cap as shown. The rod is made of ⅝-in. round iron, has an eye at one end, and is flattened at the other.



An Anchor Tent Stake

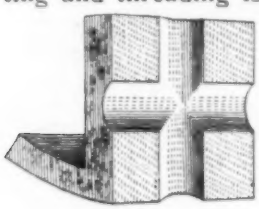
Make two lugs or prongs out of ¼ by ½-in. iron, each 2¼ in. long and taper the ends as shown. One end of each of these lugs should be drilled and countersunk for a ¼-in. rivet which fastens them to the flattened end of the rod and has play enough to allow them to fold against it. Two square holes should be cut in the pipe about 8 in. from the pointed end to allow these

lugs to extend through when they are spread. A pin fastened in the rod near the top end and working in a slot in the pipe regulates the upward and downward movement of the rod and also keeps it from twisting when the pipe is being driven. The cap at the top is to drive upon when setting the stake, and care must be taken not to hit the eye at the end of the rod.

After the stake has been driven into the ground, pass a rope through the eye and tighten. The upward movement of the rod spreads the lugs which catch the surrounding earth. The stake should be inclined towards the tent when it is being driven, so the rope will pull endwise upon it. The stake can easily be removed from the ground by pushing down upon the rod, thereby folding the lugs against the rod, and pulling up on the pipe.—Contributed by N. C. Best, Chatham, Ontario, Can.

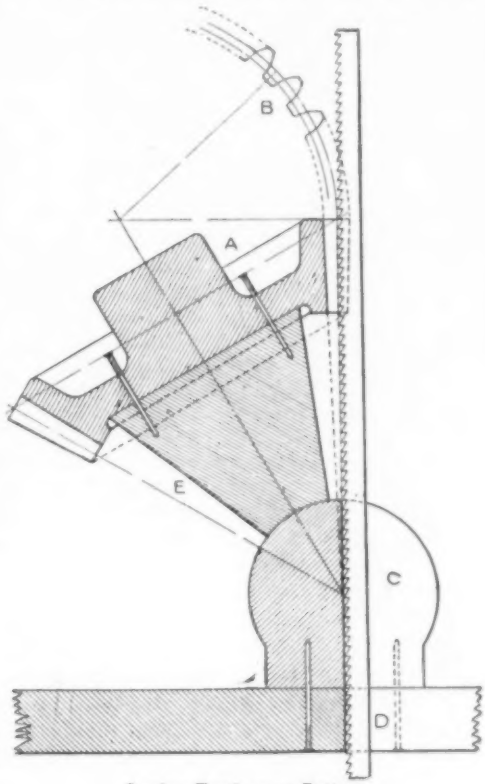
Pipe Holding Jaw for a Vise

Where a limited amount of pipe cutting and threading is done the tool illustrated is a very good substitute for a pipe vise. It is made of steel to fit the jaw of an ordinary vise, and it has two half round grooves cut for holding the pipe in two positions. Teeth may be cut in the grooves for gripping the pipe.—Contributed by C. Purdy, Ghent, Ohio.



Cutting Gear Teeth in Patterns on a Band Saw

A device whereby the teeth in bevel gear patterns can be cut on the band saw, is shown in the accompanying sketch. With this device the teeth can be cut much more accurately and quickly than shaping them by hand. Having the blank gear pattern, A, turned to the proper size, lay out the teeth on the pitch line as shown at B. Turn up a round ball, C, in the lathe,



Sawing Teeth on a Pattern

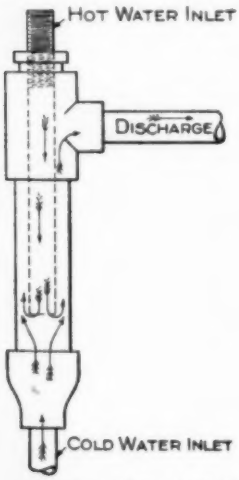
and fasten it to a board, D, with nails as shown.

Turn up a cone, E, of the proper length and hollow out one end to fit this ball. Fasten the blank gear to the cone, being careful to get it exactly in the center. Saw through the board and fasten the board to the saw table in this position. By holding the cone ball to the exact center of the ball and against the ball the teeth can be sawn out according to the layout on the blank. This device is also very handy for making experimental wooden gears. —Contributed by J. C. Hansen, Chicago, Ill.

It is best to carry a plan of the wiring system on your automobile. The owner of each car can draw up such a plan, if the manufacturers do not supply one with each machine.

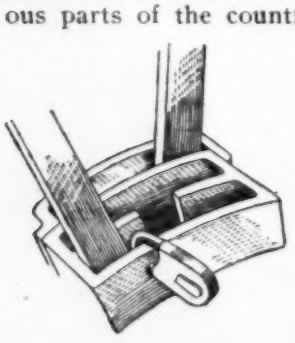
Hot and Cold Water Mixer for Shower Baths

Did you ever take a shower bath and have the temperature of the water just right for a time, and then suddenly get a dash of either cold or hot water? This is caused by the improper mixing of the hot and cold water. Good mixers are expensive, and therefore few baths in private homes are equipped with them. The mixer shown in the accompanying sketch requires very little explanation. All that is required is one reducing coupling at the bottom, a reducing tee at the top and an inside pipe with a long thread as shown in the illustration by the dotted lines. The cold water entering the bottom meets the hot water descending and both are properly mixed when they leave the discharge.—Contributed by James E. Noble, Toronto, Canada.

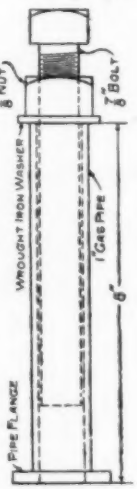


Locking a Motor Car

Owing to many motor car thefts which have occurred recently in various parts of the country it behooves every owner to adopt some plan for locking his car. A good method, illustrated herewith, consists of drilling a hole through the side of the quadrant in which the gear shifting lever operates, so that when the padlock is in place as shown, the shifting lever cannot be disengaged from the slot in which it rests. In this case the gear shifting lever is confined with the reverse gear in mesh, so that the car can only be run backward, says Motor Age. On some cars the lever can be locked in the neutral position so that it could not be run at all under its own power, but it could be readily taken in tow. Special lugs have been fitted to the gear-shifting levers and quadrants on some cars for this purpose, and almost any car with a gate type quadrant can be rendered nearly theftproof by anyone as above described.



A Home-Made Jack Screw



The accompanying sketch shows a small jack which is cheap, simple and quite useful in the shop. All that is required is a ⅞ by 8-in. bolt, one washer, a piece of 1-in. gas pipe, 8 in. long, and half of a 1-in. pipe flange. It is astonishing how much this little jack is capable of raising, says a correspondent of the Practical Engineer. It does not require over 10 min. to make.

How to Repair Steel Tapes

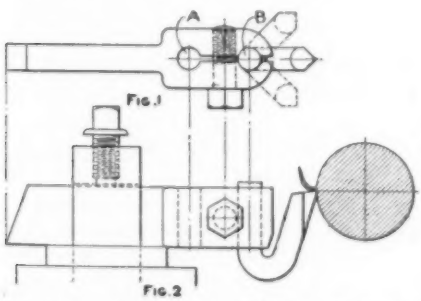
The ends of the tape left by the break must be straightened out with a pair of pliers and joined together, end to end, so as to leave the length unchanged, says Engineering News. Bend a strip of tin ½ in. wide around the joint and clamp it down firmly with the pliers. Put a few drops of soldering acid solution and a small piece of solder on the joint; hold over a burning candle or any small blaze until the solder melts. A small pine stick may be used to spread the solder and make it run into all the seams.

A field repair outfit to be carried in a civil engineer's transit or level box is made up of a vial of soldering acid, solder, a small pair of steel pliers and a few old tin can seals. The soldering acid can be made by dissolving zinc in muriatic acid to saturation. With these conveniences a civil engineer can keep his tapes in good repair.

An Adjustable Lathe Tool Holder

The accompanying illustration shows a lathe tool and holder I have been using for the past year with success. The holder is forged to the proper size for the tool post and two ⅜-in. holes, A and B, drilled ¾ in. apart. The two holes are connected by cutting a slit with a hacksaw using two blades. This allows the metal to spring enough for holding the tool secure with the screw. The cutting tool is made of a piece of round tool steel the same size as the diameter of the hole drilled in the holder. The proper shape of the tool is shown in Fig. 2. The screw should be made of ⅜-in. steel. It is not necessary to change the tool post to adjust this tool. The different positions can be obtained as shown in Fig. 1 without having to use several tools.

This tool makes an excellent thread cutter and one that will give the desired pitch with little adjustment. The entire tool when finished should be

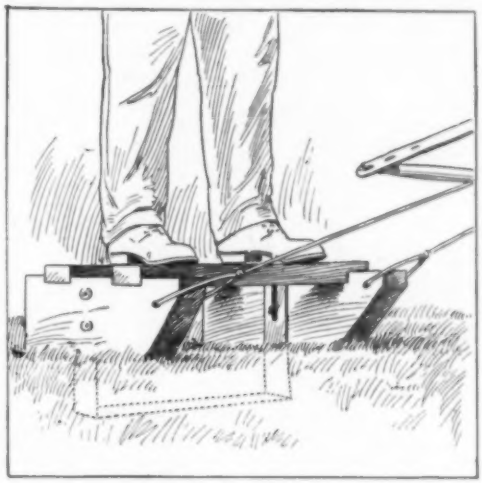


Tool Can Be Used in Different Positions

about 3½ in. long. A very good plan is to have a number of cutters made, each having a different cutting point. —Contributed by J. N. Bagley, Webber, Kan.

Cutting Soil for Sodding

The construction of the sod cutter is clearly shown in the sketch. It may be well to add that the knife blade



Cutting Sod

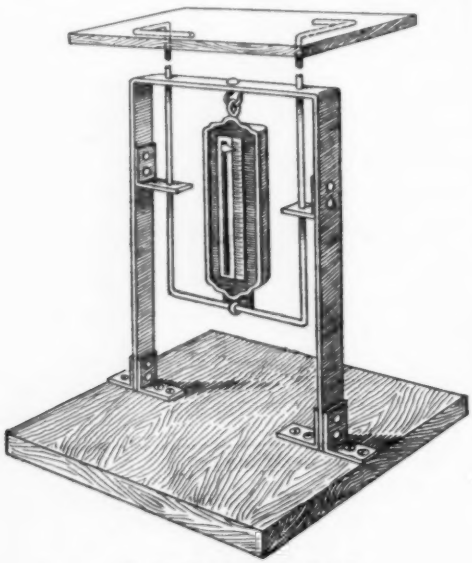
dips downward about ⅜ in. in its width of 2½ in. The knife can be adjusted to cut the sod at the proper thickness. Two men and a boy with a team cut enough sod to load a slat wagon holding 1¼ cu. yd., rolled the sod, and loaded the wagon in a trifle over an hour. The cutter is easily and cheaply made, and is a great improvement over the spade.

Temporary Automobile Tire Repair

A motorist had a bad blow-out in one of the front tires of his machine when out in the country, and not having an extra shoe along to make a change, he called on a farmer and secured a quantity of oats and a small piece of an old feed bag. The injured tube was removed and the shoe stuffed tightly with oats, the piece of bagging being placed on the inside of the shoe to prevent the oats from coming out. In this way he was able to drive to the city garage without running the car on the rim and further injuring the shoe. This would probably work only on the front wheels.—Contributed by Donald A. Hampson, Middletown, New York.

Platform Scale Made from a Spring Scale

The scale as shown in the sketch was made to weigh articles that could not be hung on the hook of a spring



Scale Mounted on Stand

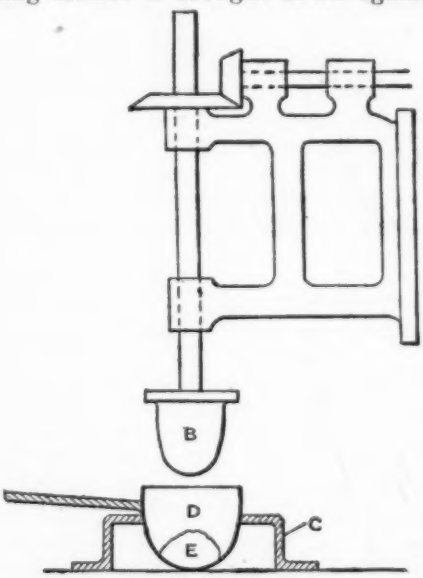
scale. The base of the scale is made from a piece of board 8 in. square to which is attached a frame made of strap iron, 1 in. wide, whose uprights are 11 in. high. The top part of the frame is 6 in. wide. A hole is drilled in the middle of the top piece and the hook taken from the spring scale fastened into it. The spring scale is hung on this hook.

The lower part or movable shaft of the spring scale is attached to a U-shaped piece of ¼-in. wire whose uprights are 10 in. high and the crosspiece 4 in. long. The upper ends of the wire are bent as shown by the dotted lines and attached to a board ½ in. thick and 6 in. square. The length of the wires between the top board and the top of the iron frame should be a little longer than the distance traversed by the needle over the face of the scale. The uprights of the U-shaped wire run through guides riveted to the frame and through the top part of the frame as shown. Adjust the pointer to zero and the platform scale is ready for use.—Contributed by John Blake, Franklin, Mass.

Daubing Foundry Hand Ladles

In a certain large cast-iron soil-pipe foundry, where it formerly kept three men busy "daubing" ladles, the superintendent has introduced a cheap machine to do the work so that now one man can in one hour daub all the ladles required for the day's work.

The cut shows the device. An old fashioned drill press was bought second hand. The spindle has a travel of about 13 in. and is provided with a simple lever feed, not shown. To the end of the lever the turned cast-iron former, B, is fastened. This former is made the shape of the inside of the finished daubed ladle, says the American Machinist. The spindle and former are counterbored. A roughly made iron centering device, C, centers the ladle D. A piece of loam, E, is put in the bottom of the ladle and the quickly rotating former is brought down against



Forming Mud Ladle Linings

it. The surplus loam is forced up the sides and over the edge. The finished daubed ladles are much neater in appearance as the work is more uniform than hand daubing.

Aeronaut's Hot-Air Balloon

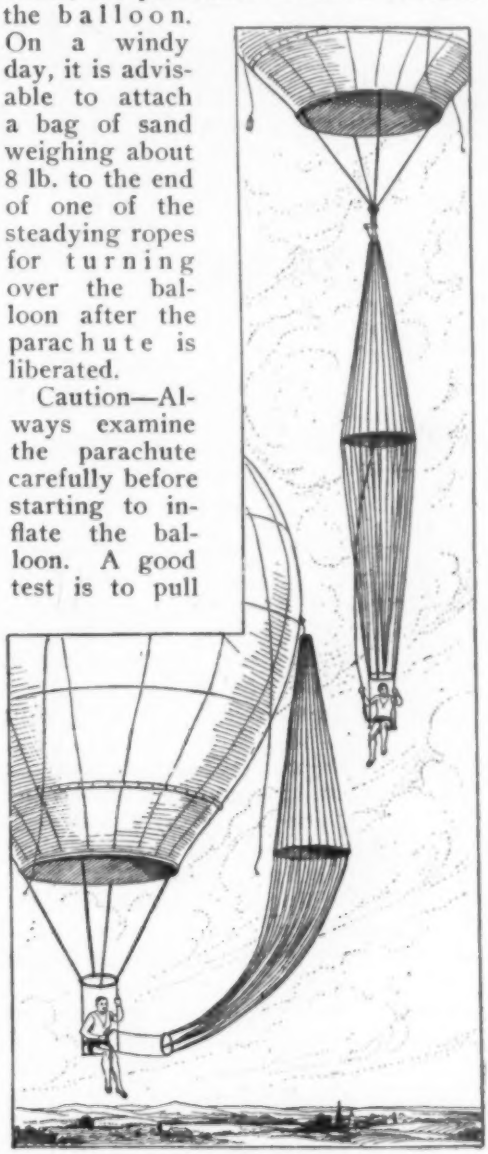
Part III—How to Descend in a Parachute

The first description is for the "leap-off" method. When the balloon is filled as described in a previous chapter, fasten a ring 2 ft. in diameter to the ends of the four 12-ft. ropes attached to the ring sewed into the cloth at the bottom end of the balloon. Attach a trapeze to this lower ring with two side ropes each about 3½ ft. long. Attach the parachute top to a small ring that has been fastened half way up the side in the cloth of the balloon for this purpose. Tie it to the ring with a cord or string that will break with a weight or strain equal to about 75 lb. The parachute described in a previous chapter will weigh about 35 lb., if made of the same material as the balloon. The cord or string will hold the parachute until the aeronaut makes his leap. The extra weight applied breaks the cord or string and the passenger drops rapidly until the parachute opens. The balloon, being relieved of its weight soon turns over, empties the hot air, and then drops to the earth. When using this "leap-off" method it is necessary to fasten yourself securely to the trapeze of the balloon for safety.

When using the liberating knife the four 12-ft. ropes attached to the ring fastened in the cloth at the lower end of the balloon are tied into a loop. Pass a strong cord through this loop and through the knife hole in the liberating knife and tie securely. Fasten the parachute top to the bottom of this knife. Fasten a cord to the handle of the knife blade and pass the loose end through the hole in the top and down inside of the parachute within easy reach of the aeronaut sitting on the trapeze.

When the altitude desired is reached the cord is pulled to cut the fastening cord and the parachute drops rapidly until it opens. Then you descend to the earth slowly. This is the safest method of the two as you ascend fastened to the lower part of the parachute, the parachute attached beneath the balloon. On a windy day, it is advisable to attach a bag of sand weighing about 8 lb. to the end of one of the steadying ropes for turning over the balloon after the parachute is liberated.

Caution—Always examine the parachute carefully before starting to inflate the balloon. A good test is to pull



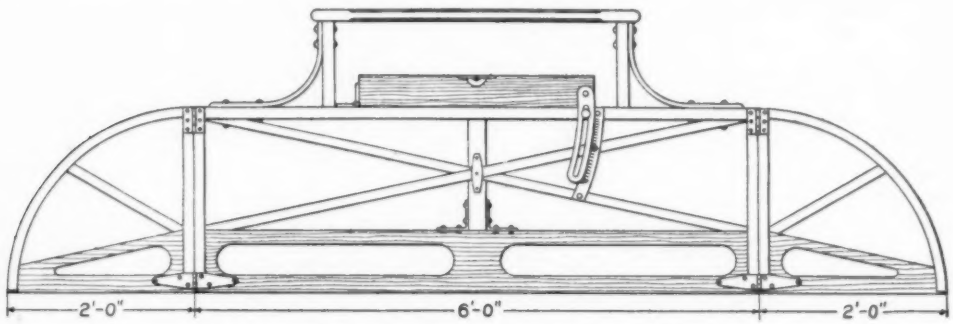
Two Methods of Using a Parachute

the cords and cloth against the wind allowing it to open to its full extent. Be careful to see that the parachute cords are straight and not tangled when at-

taching it to the balloon. When using the last described method of attaching the parachute to the balloon always look above your head and see that the cords are straight and not twisted around under the cloth end. Sometimes the cords become twisted as you ascend. If you cannot get them straightened while in the air do not cut the parachute loose.

A Grading Level

A handy tool for general leveling and for grading streets, or for setting curbs, pipes, ditches and the like to any desired grade, is shown in the accompanying sketch. It is so simple as to hardly need a description, says a correspondent of the Engineering Record. A light, rectangular frame of wood, stiffly braced, has for its lower member a board 8 in. wide and 6 ft. long, with framed end pieces, each 2 ft. long, hinged as shown. When extended the board is 10 ft. long and held in position by latches, not shown in the sketch. The lower edge of the board is shod with a thin strip of steel.



Level as Well as Degree of Elevation Can Be Found

Centrally located on its upper member is a carpenter's level, hinged at one end and provided at the other end with a pointer and set screw which passes through the slot of an arc in the pointer. The pointer shows on a fixed graduated plate the degree of elevation, in inches per hundred feet, or the per cent of grade required. Above the level is a handle for carrying it from place to place, but the handle may be dispensed with if used in a low tunnel or other confined place.

The apparatus can be constructed in a short time by any good carpenter. It can be used with greater ease, speed and accuracy than the ordinary leveling board.

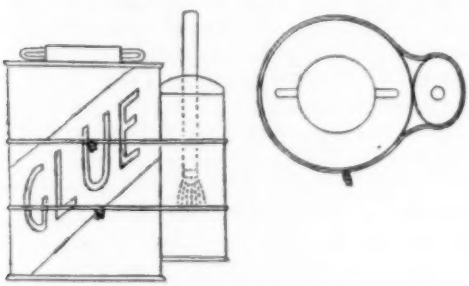
Varnish on Automobile Bodies Spoiled in Washing with Soap

The use of needlessly strong alkali soap in cleaning automobiles, neglect to wash off the soap and failure to dry the varnished surface perfectly are probably responsible for more damage to paint and varnish than all other causes combined, says Automobile Dealer and Repairer. As a matter of fact, neither soap nor water should ever be used on an automobile above the under sides of the mud guards, except in cases where the mud is caked on the body in large quantities. In most cases the first signs of wear on the painted portion invariably show on the varnished portions of the engine bonnet. This is due to the fact that it is frequently covered with mud on the return from a run and is then washed with soapy water while the metal is still hot. Soap should not be used on the bonnet until it has cooled.

¶It is not economy to save emery wheels by neglecting to keep them true and sharp.

Glue Brush Holder

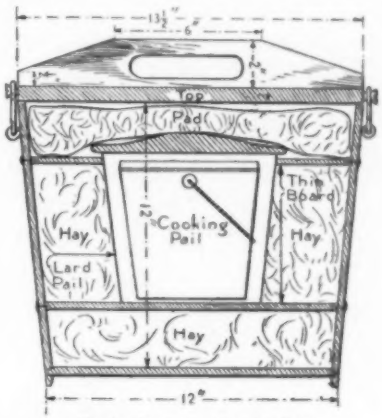
Many a small shop uses glue in quantities too small to necessitate a regular equipment of melting-pot, double boiler, etc. In such cases liquid glue proves a handy and efficient substitute. The small "trial size" bottle, with the brush fitting through a metal cap which replaces the drawn cork, is too small, and on the larger size the cap is so big that it would be cumbersome if used in this way. As a result the brush, or wooden paddle which is sometimes used, becomes hard with stiffened glue. Illustrated herewith is an attachment which may be quickly made and which will keep a brush at all times soft and clean. It consists of a long narrow tin case, such as is used for holding a small bottle of liquid courtplaster, etc., wired to the glue-pot. The cover of the tin case is perforated and the brush handle stuck through. The little "burrs" around the edges of the hole are then bent down close to the brush, which grips firmly and makes a watertight connection. This case is then filled with water. If the case leaks and no solder is handy, a little melted beeswax poured inside will stop all the cracks.—Contributed by C. W. Nieman.



Keeps the Brush Soft

Home-Made Fireless Cooker

A practical fireless cooker, as shown in the illustration, can be made by using a common candy bucket, two lard pails—or any vessels having clinched lids. Place chopped hay or straw in the bottom of the bucket over which put a piece of composition board or a thin piece of box board cut round to fit the inside of the bucket. Insert the lard pail and pack chopped hay around



Made From a Candy Pail

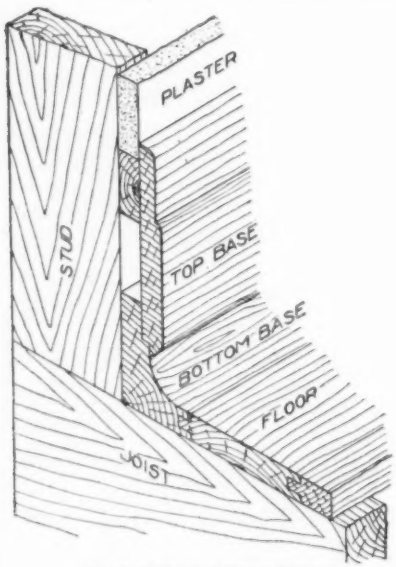
it. Lay another piece of composition board over this, having first cut a hole through it for the top of the lard pail. Force the composition board down over the hay and hold it in place by tacking through the sides of the bucket. Make this piece flush with the top of the lard pail.

Make a pad out of a piece of carpet or other heavy material and stuff it with hay to cover over the vessels. The top of the candy bucket should be fastened to the sides with three hooks and eyes. A handle may be screwed to the lid of the bucket which also serves as a cleat to keep the lid from warping. The lard pail in which the food is cooked, before placing in the cooker should be smaller than the one remaining permanent in the bucket and the bail, if too large, may be cut off and reset in the sockets. The time for cooking foods as applied to commercial fireless cookers should be used, and the results will be exactly the same. The cost of making such a cooker is practically nothing.—Contributed by Harry Sowden, Colome, S. D.

¶ Emery wheel arbors should be fitted with flanges or washers having a slight concave to their face.

A New Type of Baseboard

In finishing the interior of dwellings the right angle corner formed by the baseboard and the floor, either with or



Solid Bottom Corner Base

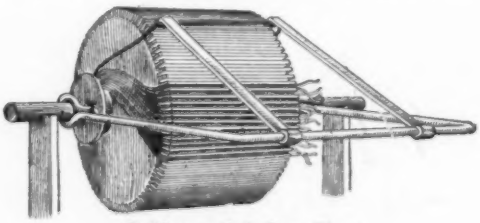
without a quarter round, has never been quite satisfactory. The square corners catch the dirt and the pieces forming it have a tendency to warp and form cracks. The accompanying sketch shows a new type of a two-piece baseboard which entirely eliminates these troubles. The lower piece joins the flooring and is laid with it, while the top piece is put on after the interior is finished. When complete it has a very neat and pleasing appearance, and it is also sanitary.—Contributed by F. W. Haglock, Akron, Ohio.

A Temporary Repair for a Broken Lamp Glass

If the glass of the tail lamp breaks, there are two ways by which immediate progress is rendered possible. The first is to procure a sheet of thin red tissue paper at a stationer's and to tie it over the frame which held the glass. As there is no head draft against the tail lamp, this is practicable, says Automobile Dealer and Repairer. A second method, which applies to any lamp on the car, is to get a sheet of thin paper, double it, grease it, and lash it over the lamp front with a wire. This is sufficiently transparent to allow of legal limit traveling with a single acetylene headlight, and at this pace a double layer of the paper is windproof for a good many miles.

Armature Coil Puller

The accompanying illustration shows an armature coil puller which has been found a convenient device for building armatures. The bar upon which the hooks are placed are of cold rolled steel, while the hooks are of flat strips of iron. The hinged loops at the ends of the bar are slipped around the armature shaft as shown, the pinion on the shaft being held rigidly by a double-jawed spanner. The hooks then grip the coil from the inside, and a downward pressure on the bar pulls the coil into position. Where the coils are very thin, consisting of but one layer of wire, a split hook will be found advantageous, says the Electric Traction Weekly. To protect the coils as they are being drawn over the slots, a strip of sheet iron 3 or 4 in. wide is bent to fit the surface of the core, being allowed to project over the sides ¼ in. This will effectually guard the coils from injury. No dimensions are here given, as it is advisable to make the puller to fit the work on which it is to be used. One thing to be observed,

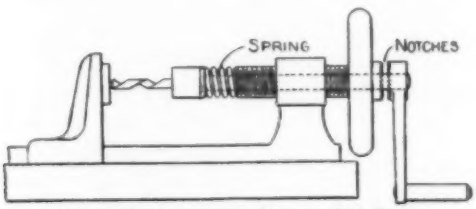


Pulling a Coil Into Place

however, is that the length of the hooks from the centers on which they swing should be the same as the distance from these centers to the center of the armature shaft.

Self Feed for a Hand Drill

The one disadvantage of the ordinary blacksmith's hand drill is the lack of a self feed, and especially so when it is necessary to hold the article being drilled with the free hand. To overcome this difficulty I designed the device shown in the sketch. I secured a coil spring about 1 in. long and placed it on the shaft between the chuck and the feed screw. I cut notches in the hub of the hand wheel and corresponding notches in the hub of the crank. When the pressure of the bit on the piece being drilled becomes too light the spring draws the crank into contact with the hub of the hand feed wheel and the teeth meshing causes the feed wheel to revolve until the



Hand Feed Changed Into a Self Feed

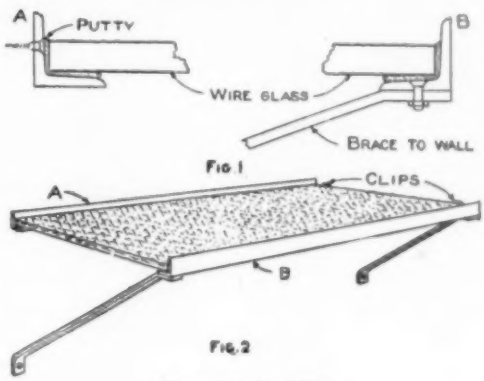
pressure of the drill pushes the crank free again. The spring also causes a more even cutting pressure.—Contributed by Thos. L. Parker, Olaf, Ia.

Home-Made Glass Drip Board for a Sink

The glass drain board shown in the accompanying sketch has several advantages over the ordinary kind, the principal one being that it prevents insects from hiding on the under side.

The drain board proper is of ⅜-in. wire glass, such as is used in fireproof buildings, set in angle irons as shown. The angle iron A is fastened to the wall with screws. The outside angle iron B is held in place with two braces of iron bent as indicated. The glass is set in putty placed in the angle of the irons. This is shown in Fig. 1. The complete drain board is shown in Fig. 2.

The strength of the glass is sufficient to stand ordinary usage, but care must be taken not to set very hot pots on it. Plate glass can be used instead of

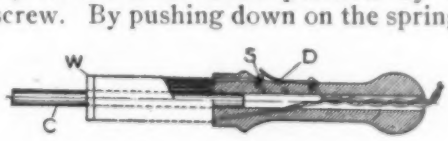


Glass Set in Putty

the wire glass but the thickness should not be less than ½ in. The wire glass is the best to use.—Contributed by A. P. Connor, Washington, D. C.

A Lifting Magnet

A handy little magnet that can be used for lifting small objects out of holes, etc., is shown in the accompanying sketch. The core, C, is made of ¼-in. diameter soft steel. The wood handle has a ¼-in. hole through its center in which one end of the core is driven. A fiber washer is placed on the core in the position shown and the space between it and the handle wound with No. 26 single cotton-covered wire. Fasten one end of the wire under the head of the screw S and connect the other to the battery. The return wire is fastened to the spring D, which is held in position by a screw. By pushing down on the spring

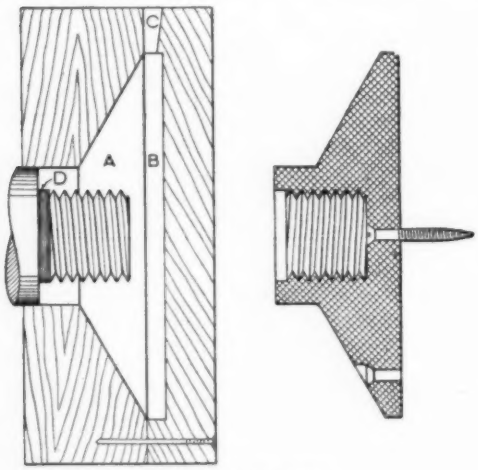


For Lifting Objects from Holes

with the thumb the circuit is completed and the core magnetized. This little magnet will prove very useful on a toolmaker's bench.—Contributed by C. G. Smith, Brooklyn, N. Y.

Faceplates Made of Babbitt

Many pattern-makers and woodworkers are using faceplates made of babbitt on their lathes, instead of the



Mold and Faceplate

usual iron ones. They are easy to make and give as good service as the others.

Make a temporary faceplate by boring a hole in a 2-in. piece of plank and screwing it on the lathe spindle. Upon this the two pieces A and B, shown in the accompanying sketch, are shaped. Fasten the two together with nails or glue, thus forming a mold. Bore a hole, C, at the top for pouring and venting. Wrap some string tightly about the spindle at D as shown, then adjust the mold in place. After pouring remove the mold, turn the faceplate true, and bore holes for the screws. Any number of plates can be taken from this mold, and by slightly changing it several different designs can be made. —Contributed by P. H. Campbell.

Engineers' Stethoscope

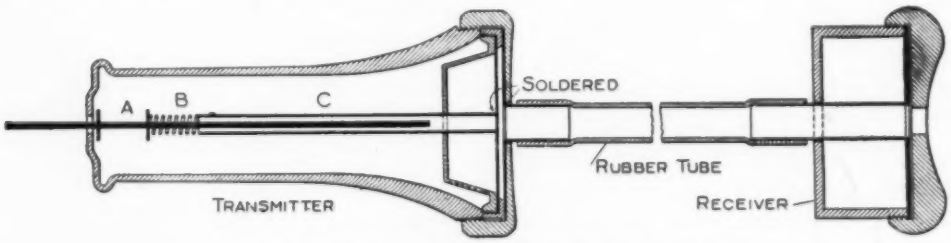
The majority of engineers are, no doubt, familiar with the physicians' stethoscope, the little instrument which is placed over the heart or lungs of a patient for the purpose of discerning any irregularities that may be present more clearly than would be possible with the ear alone. The instrument is primarily an intensifier.

A useful instrument, which for lack of a better name we shall call a stethoscope, is being used to advantage by many practical engineers, says a correspondent of Power.

By its use the engineer can more readily detect existing errors than is possible by means of the ear. Its use has been found valuable in detecting loose follower bolts or nuts, broken snap rings, leaking pistons, etc. In the examination of flywheels for fractures or loose bolts it is also found useful. The mere ring of a hammer blow is oftentimes deceptive when the unaided ear is depended upon to catch the sound.

Engineers sometimes put one end of a pencil or rule between their teeth and hold the other end against a water or steam line to determine if the flow is normal. The same principle is made use of in the stethoscope.

The material for its construction can be obtained for practically nothing at a telephone exchange. New material



Instrument for Detecting Errors in Machinery

is not necessary, as old, slightly-cracked receiver shells will answer the purpose. The accompanying sketch shows the detail construction of the apparatus. The rod A is placed against the cylinder, water pipe or flywheel

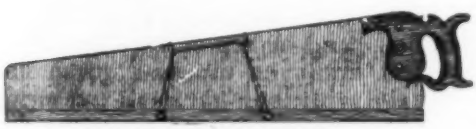
rim, while the small receiver is placed to the ear. Better results will be obtained if two small receivers are used. The connections are made of ¼ or ⅜-in. rubber tubing.

The small spring B is inserted between the rod A and the tube C to prevent pressing the rod A so tightly against the object being tested that slight vibrations cannot be detected. The faint sounds caused by the existing error are transmitted through the rod and tube against the regular telephone receiver diaphragm. The sounds, here intensified, are conducted through the tube connections to the diaphragm in the small receiver.

Any engineer can make this instrument during spare time, and its regular use may save serious accidents.

Handsaw Guard

The accompanying illustration shows a guard to place on handsaws for carrying them in crowded streets and cars. The guard also prevents injury to the teeth when the saw is placed in with other tools. It is made of a small grooved stick, four large

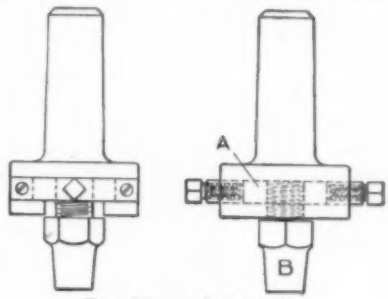


Protecting the Teeth

rubber bands, four screws, a piece of wire and some washers. The wire is bent in such a way as to fit over the back of the saw blade and have two loops on each side for the rubber bands. The guard can be slipped on and off the saw quickly.—Contributed by W. A. Jaquythe, Richmond, Calif.

An Adjustable Guide Pin for Profiling Machines

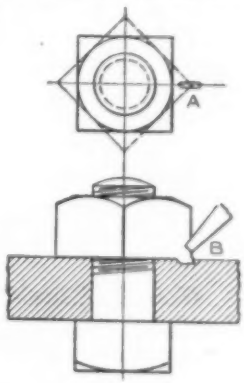
When using the pin as shown in the accompanying sketch, it is not necessary to have a set of extra pins on hand in case the cutter has to be ground, which makes it smaller. The nut A fits in the slot and carries the pin B, which screws into it with the end up against the top of the slot, then locking it in place. The two set screws are for adjusting the nut lengthwise of the slot. If a cutter is ground, making it somewhat smaller, the distance between it and the guide pin can be adjusted so that it will cut the same profile as before grinding. This device is an improvement as one adjustable pin serves the purpose of a set of solid ones. The pin is used for duplicating irregular shaped models on a profiling machine. —Contributed by G. E. Quinn, Hartford, Conn.



Two Views of the Guide

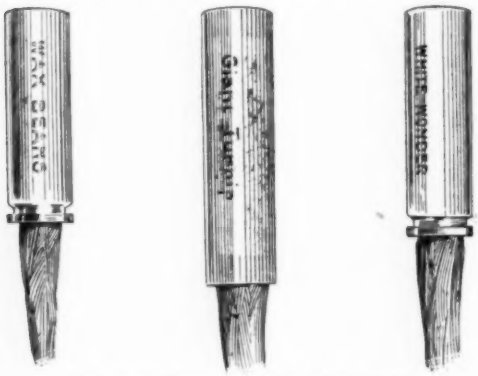
A Simple Nut Lock

There are a great many devices for locking nuts, but the one shown in the accompanying sketch is about as simple and effective as any of them. Screw the nut up to the desired tightness and mark the position of one of the corners, then loosen it a little and make a slot in the metal with a sharp chisel as shown at A. Tighten the nut again, then force the corner of the nut down into this slot by striking it with a punch, held as shown at B. This will hold the nut securely in its place.—Contributed by W. Parker, Olaf, Iowa.



Permanent Shrubbery and Vegetable Garden Labels

In endeavoring to secure a permanent label which would be at the same



Names on Paper Covered with Bottles

time cheaply and easily prepared, the following plan was hit upon. First secure a sufficient number of small bottles with corks, says House and Garden. The small tubes that prepared photographic developers come in will do, or one or two drachm homeopathic vials may be secured at your local drug store. Wire and some small stakes with one end trimmed down to fit the necks of the bottles, complete the equipment. Copper binding wire is best as it is very pliable and does not corrode when exposed to the weather.

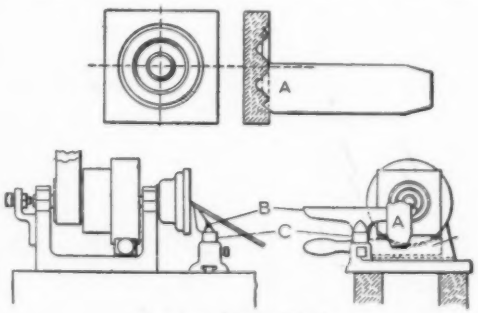
For the seed bed, clip from the end of the seed package the strip bearing the name of the variety planted, slip this into the bottle, cork tightly and wire to a stake at the end of the row. Or if desired, the bottle may be slipped over the end of the stake as shown in the sketch.

Tool for Turning Corner Blocks

The smaller wood-turning mills often receive rush orders for from 200 to 300 corner blocks of a special design, for interior finishing, to be turned up by hand. It would not be profitable to order this amount in a machine-made block. If these blocks are turned by hand with chisels it is very slow work and the profits are small. The accompanying sketch shows an improved chisel or cutter by the use of which the work can be turned out quite rapidly. This cutter is made out of a plane bit and has the cutting edge ground to suit the design of the block.

Carefully turn up a sample block, then saw it in half and grind the cutter to fit the outline of the block as shown in the upper sketch. A cutter should be made for each design of block. These cutters should be about ¼ in. wider than the cut desired so they will overlap on each side. The bevel should be slightly longer than that on a plane bit and in grinding it be careful not to burn the edge, or the temper will be drawn. Finish the edge with a slip-stone. If carefully made and of good material, this cutter will turn up from 500 to 600 blocks without regrinding, and will require only occasional sharpening with the slip-stone.

The manner of using this cutter is of as much importance as its making. If it is forced straight into the work it will chip the bead and tear the corners of the block. The proper way to use it is to set the steady rest, B, slightly below the center line so that the cutter will lay at an angle of about 30 deg. from the horizontal. Place the left hand on top of the cutter and hold it firmly on the rest, grasp the rear end with the right hand and make a light cut straight in; then move the rear end of the cutter back and forth, using the cutting edge as a fulcrum,



Turning Corner Blocks

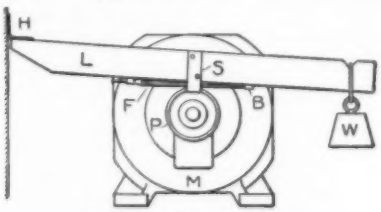
and at the same time forcing it into the work. This method will cause the tool to shave out the wood instead of knock-

ing it out in chips. On soft wood no sandpapering will be required if the tool is sharp.

The center-rest should have a collar, C, of the right height between its shoulders so that it can be swung clear when removing the blocks without resetting. The headstock bearings should be as tight as they will run without heating and there must be no end play, otherwise the cutter is liable to dig into the work. A simple brake can be made of a piece of hard wood, cut to fit the largest pulley on the headstock, and covered with a piece of belt leather. By using this brake the lathe can be stopped quickly, thereby saving much time in taking off and putting on blocks. The lathe should run at about 2600 or 2700 R. P. M., which is the fastest speed of most lathes. About 600 blocks a day can be cut with this tool which brings the cost down to a figure that compares favorably with machine-made blocks.—Contributed by J. H. Wyatt, Philadelphia, Pa.

How to Groove a Motor Pulley

As I wished to make a grooved pulley out of the flat-faced one on my motor, I rigged up the device shown

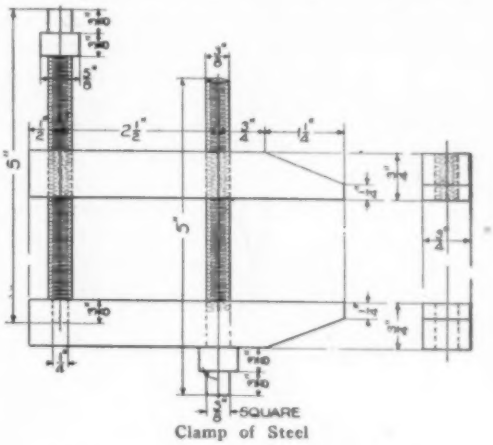


Cutting a Pulley Groove

in the accompanying sketch to do the work. The lever, L, is a piece of wood as wide as the pulley face. One end is hinged to the wall at H, and the other is notched for attaching the weight W. Under this lever I fastened a rat-tail file, F, by means of the bands B. The straps S keep the lever in position on the pulley face P, and as it turns the file cuts a round groove in it, which can be made as deep as desired.—Contributed by H. Hahn, Chicago.

A Machinist's Clamp

A cheap, handy and durable steel clamp for small work in the machine shop or about the home, that can be

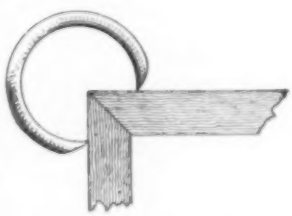


Clamp of Steel

made by the ambitious machinist is shown in the accompanying drawing. Secure a piece of cast steel of suitable size and cut off two lengths, each 5 in. long, plane them to ¾-in. square, and finish as per drawing. The screws are made of ⅝-in. cold rolled steel, and can be turned up in the lathe. The outer ends of the screws being ⅜-in. square the clamp can be operated by a ⅜-in. S-wrench.—Contributed by R. E. White, Schenectady, New York.

Clamp for Holding Mitered Corners

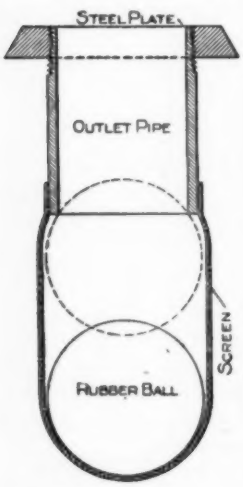
Secure enough $\frac{3}{16}$ or ¼-in. round tempered spring steel wire and make four rings 4½ or 5 in. in diameter. After the rings are formed the ends can be filed to a point on the inner surface.



They will be found very convenient in holding the corners of a frame while fitting the miters.—Contributed by D. O. Wilkins, Hempstead, Texas.

A Check Valve for a Drain

Secure a steel plate of suitable size and bevel the edge as shown in the accompanying sketch. This bevel is to hold the plate securely in the concrete floor when it is in place. A hole the size of the drain pipe should be tapped in the plate and a short piece of pipe screwed in it. Make a cage of copper wire large enough to hold a hollow rubber ball, which is somewhat larger than the opening in the pipe. The cage should be long enough to allow the ball to have a vertical movement of 2 or 3 in. and is soldered to the end of the pipe. Water will readily flow out of the drain, but if it backs up, the hollow ball will rise and stop the opening. This simple device is very handy where a heavy rain is liable to cause the water to back up in the drain. —Contributed by V. Metzech, Chicago.



A Never-Slip Nail Punch

This punch has the appearance of the ordinary kind, the only difference being the small diamond point in the center of the flat punch end. The point will hold the punch on the nail head when a blow is struck.

I once struck a punch a hard blow and the end slipped on the nail head

Diamond Point End

and the punch went through a window. I was "out" and so was the punch. I then proceeded to make a diamond point on my punch as described and I had no further trouble.—Contributed by C. Purdy, Ghent, O.

How to Clean and Care for Spark Plugs

Much of the trouble with spark plugs becoming dirty can be avoided to a large extent by not speeding or racing the engine while idle. The high speed causes the oil in the crank case to be splashed up on the walls of cylinders and into the plugs. This oil is then carbonized by the heat of the explosions, causing short circuits in the plugs. The electric discharge instead of taking place between the points of the plug, creeps across the carbon deposit, which kills the life of the spark, thus causing the cylinder to miss fire.

Much of the carbon deposit in cylinders can be avoided by giving the inside of the cylinders a bath of kerosene oil frequently. This should be done while the engine is warm, immediately after returning from a trip. Remove the plugs and squirt 1/3 qt. of kerosene into each cylinder, taking pains to squirt the oil around on the walls as much as possible. Replace the plugs and let stand several hours. Then start the engine to burn out the oil, and carbon that has been loosened. A dense smoke will issue from the muffler exhaust until all the kerosene is burned. Clean the plugs and the engine will run without a miss if the other parts are mechanically right.

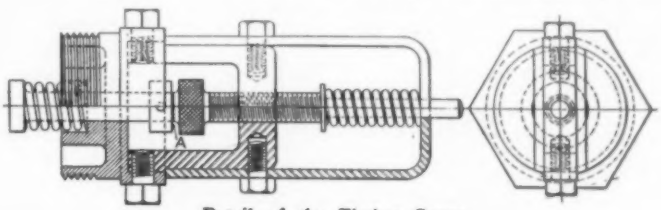
Some spark plugs are designed to be taken apart for cleaning, while others are not made to take apart, but instead are self-cleaning to a certain degree. In cleaning plugs that can be taken apart, first remove the porcelain core and brush off the carbon deposit with a tooth brush dipped in gasoline or ammonia, then scrape off all the carbon from the rest of the plug, brighten the spark points, and reassemble Plugs that cannot be taken apart easily should be brushed out well with ammonia and the points brightened.

Most people are at a loss to know how to set spark plug points so as to get the best and most even explosions in all cylinders. After cleaning the plug parts thoroughly, screw them together. Then if you can slip a new silver dime between the points, the

distance is correct. Otherwise make the distance between the points to equal the thickness of a dime.—Contributed by C. E. F.

Valve Timing Gauge

A new design of a gas engine valve timing gauge that will prove useful to automobile repairmen is shown in the accompanying sketch. With this device the valves can be timed more accurately and with less trouble than by the old screwdriver method. The construction of the gauge is fully shown in the detail sketch. In use it is screwed into the valve plug hole in the cylinder with the lower plunger resting on the valve. Adjust the top plunger so that a thin sheet of tissue paper will just slip in between the ends of the plungers at A. Now turn the flywheel slowly and as soon as the paper is gripped by the plunger you will know that the valve is just starting to open. By turning the flywheel in the same direction until the paper is released the closing point of the valve can be determined. As the paper in question is but .001 in. thick great accuracy can be obtained with this gauge.—Contributed by C. T. Schaefer, St. Louis, Mo.



Detail of the Timing Gauge

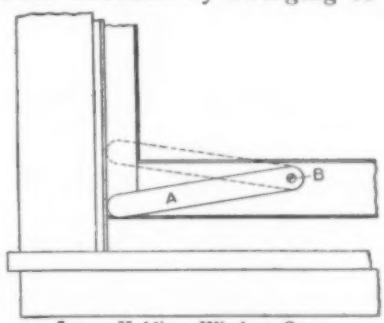
A Door Holder

Stable and woodhouse doors are very annoying when the wind blows them shut at a time they are wanted open. This may be remedied by opening the door entirely back against the side of the building and driving a nail through the door at the top and into the weather board. Pull the nail out of the board, but leave it sticking through the door. When the door is pushed back, the point of the nail sticks into the hole in the board, thus holding the door against the wind.—Contributed by Pleasant W. Dennison, Hope, Ind.

A Home-Made Window Fastener

There still remain in use many windows which are not equipped with either weights or springs, and when one wants to raise one of these a stick of just the right length never seems to be available, says a correspondent of the American Thresherman.

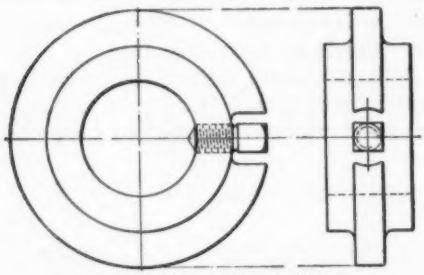
A handy and effective home-made device, which not only serves to hold the sash up at any desired point, but which will also hold it down, is shown in the accompanying sketch. It consists simply of a strip of hard wood, A, secured to the bottom sash rail by the wood screw, B, on which it swings freely. The strip, A, should be 1½ in. wide, ½ in. thick, and anywhere from 6 to 12 in. long. The screw should be at such distance from the side of the sash that, when the other end of the strip touches the window jamb, it will stand at about the angle shown. In this position it will serve to hold the sash up, and, when desired, will hold it in the opposite direction by swinging to the position shown by the dotted lines. Care should be taken to get the screw in the right place and fastened to the work solidly, as the successful operation of the device depends upon having the screw of good size and properly put in.



Lever Holding Window Open

Safety Collar

Many bad accidents are caused by the heads of setscrews in collars catching in workmen's clothing. These could be avoided if collars of the design



Setscrew Cannot Catch Clothes

shown in the accompanying sketch were used in dangerous and exposed places about machinery. A supplementary flange or collar is cast on to the ordinary collar, which has an opening for a setscrew. The collar presents a neat appearance on a shaft, is perfectly safe and also inexpensive.—Contributed by D. A. Hampson, Middletown, N. Y.

A Substitute Stop Cock

An inexpensive stop cock is often desired on steam or water pipes to serve as an air or exhaust valve. Where

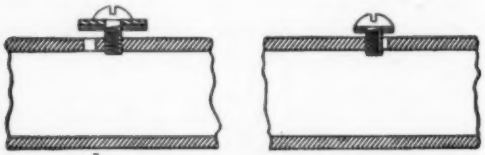


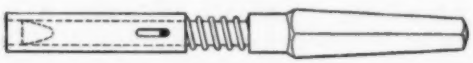
FIG. 1 FIG. 2

Two Kinds of Air Vents

there is no petcock handy, a good substitute can be made as follows: Drill a ⅛-in. hole through the side of the pipe in a convenient place. About ¼ in. from this hole, drill and tap another hole of the same size. Secure a brass machine screw to fit the threads and solder close to the head a brass washer ⅝ in. in diameter. Next to this place a rubber washer of the same size. By tightening or loosening the screw the valve is closed or opened, as shown in Fig. 1. Another method along the same line is shown in Fig. 2. This necessitates the drilling of only one hole, which, after being tapped, is filed away in a notch as shown. No washer is required when using this plan.—Contributed by C. W. Nieman, New York City.

A Screwdriver for Headless Setscrews

In a large textile machinery plant where there are thousands of headless setscrews used they have a screwdriver like the one shown in the accompanying sketch, says a correspondent of American Machinist. Anyone who has ever had a quantity of screws to put in will appreciate the fact that with this screwdriver it is not necessary to hold the fingers at the end of the screwdriver to prevent it from slipping out of the slot. It



Hold a Screw While Turning

also sets each screw to a determined depth, according to the location of the pin. About twenty ¼ by ¾-in. screws can be run in flush with the casting in one minute with this device.

Correct Air Pressure for Automobile Tires

For the purpose of informing car owners as to the proper pressure to be used in the inflation of tires in proportion to the weight carried, a manufacturer of rubber tires has compiled the following table. The weights are for cars unloaded. For weights exceeding 1,000 lb. per wheel, 5-in. tires and over are recommended.

Size. Inches.	Wt. per Wheel. Pounds	Air Pressure Recommended Pounds
28 to 36x2½	225	40
28 to 36x3	350	50
28x3½	400	60
30x3½	450	60
32x3½	550	60
34 and 36x3½	600	60
30x4	550	75
32x4	650	75
34x4	700	75
36x4	750	75
32x4½	700	85
34x4½	900	85
36x4½	1000	85
36x5		90

AMATEUR MECHANICS

Spring Board for Swimmers

A good spring board adds much to the fun of swimming. The boards are generally made so that the plank will bend, being dressed down thin at one end and fastened. The thinness of the plank or an insecure fastening causes many a plank to snap in two or come loose from its fastenings in a short time.

The accompanying sketch shows the method of construction of a spring board that does not depend upon the bending of the wood for its spring. It is made of a plank 2 in. thick and from 14 to 16 ft. long, one end of which is secured with a hinge arrangement having a U-shaped rod whose ends are held with nuts. On each edge of the board at the lower end are fastened two pieces of strap iron each about 1 ft. long with the lower ends drilled to fit the horizontal of the U-shaped rod.

Secure a pair of light buggy springs from a discarded rig and attach them to the ends of a square bar of iron having a length equal to the width of the plank. Fasten this to the plank with bolts as shown in the sketch. Should the springs be too high they can be moved forward.—Contributed by John Blake, Franklin, Mass.

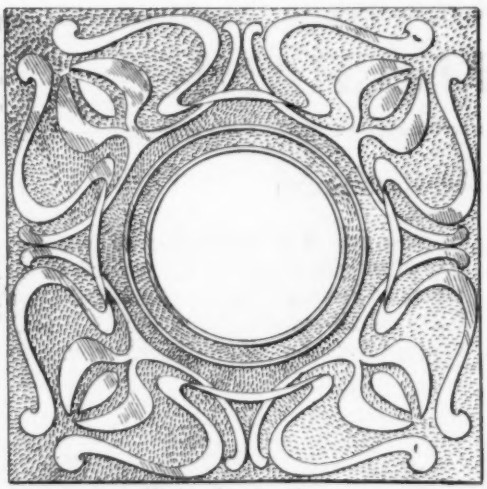
Buggy Springs Used Beneath the Board

Brass Frame in Repousse

Repousse is the forming of raised designs on metal by hammers and punches, the design being worked up from the reverse side. There is nothing especially hard in working up the design of the frame shown.

Punches can be purchased, as can the pitch bed or block. Both can be made easily, however. There will need to be several punches of different sizes and shapes. A piece of mild steel about ⅜ in. square can be easily worked into tools shaped as desired. A cold chisel will be needed to cut the metal to length, a file to reduce the ends to shape, and a piece of emery paper to smooth and polish the end of the tool so that it will not scar the metal.

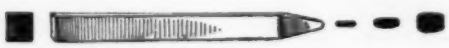
A small metal box must be secured to hold the pitch. The illustration shows an iron receptacle. The pitch is prepared by heating the following materials in these proportions: pitch, 5 lb.; plaster of Paris, 5 lb.; tallow, ½



Design for the Frame

lb. To put it in another way, use pitch and plaster in equal parts with 1/10 part tallow. See that the pitch and plaster are dry so that the moisture will not cause the pitch to boil over. Keep stirring the mass so that it never boils. Melt the pitch first and add the plaster by degrees.

For a piece of repousse such as the frame shown, secure a piece of brass of about No. 18 gauge. With carbon paper trace the design on the brass. Place the metal on the pitch bed and work over the outline of the design. Use the chisel-edged tool and try to



Working Out the Design

make the lines continuous. When this has been done, heat the pitch slightly and place the metal, design down, on the pitch, and with the raising punches work up the shape as desired after the pitch has hardened. When the desired form has been obtained, turn the metal over and "touch up" any places improperly raised. The metal will probably be warped somewhat. To remedy this, place a board on the metal and pound until the metal assumes a flat shape again. Next drill a hole in the center waste and saw out for the opening, using a small metal saw. Trim up the edges and file them smooth.

Clean the metal thoroughly, using powdered pumice with lye. Cotton batting fastened to the end of a stick will make a good brush. Upon the cleansed metal put a lacquer to prevent tarnishing. Metal clips may be soldered to the back to hold the picture in place and also a metal strip to hold the frame upright. These should be placed before the metal is lacquered.

Finding the Horsepower of Small Motors

A small motor often excites curiosity as to its true horsepower, or fraction of a horsepower. Guesses in this direction vary remarkably for the same motor or engine. It is comparatively easy to determine the horsepower put out by almost any machine by the following method which is intended for small battery motors and small steam engines.

Before giving the description, it may be well to know what horsepower means. Horsepower is the rate of work and a unit is equal to 33,000 ft. lb. per minute, or 550 ft. lb. per second. That is lifting 33,000 lb. 1 ft. in one minute or 550 lb. 1 ft. in one second. This may be applied to the problem of finding the horsepower of a motor by fastening a piece of twine about 25 ft. long to the shaft of the engine or motor to be tested in such a way that when the shaft revolves it will wind up the string similar to a windlass. Place the motor in such a position that the twine will hang freely without touching anything; out of a high win-

dow will do. Fasten a weight to the other end of the line as heavy as the motor or engine can lift and still run. It must weigh enough to slow the power down a little, but not to stop it. Mark the position of the weight and start the motor, at the same time accurately measuring time in minutes and seconds it takes to lift the weight from the lowest point to the highest. Next measure accurately the distance in feet covered by the weight in its ascent and obtain the correct weight in pounds of the weight.

Multiply the weight by the distance covered and divide the result by the number of minutes or fraction of a minute obtained and divide this last result by 33,000 and the quotient will be the horsepower of the motor or engine.

Perhaps an illustration will make this solution much plainer. Suppose the motor will lift a weight of 1 lb. and still revolve, 30 ft. in 10 seconds or 1/6 of a minute. Multiplying 1 by 30 we get 30, which divided by 1/6 gives 180. This in turn divided by 33,000 equals in round numbers 1/200 part of a horsepower.—Contributed by Harold H. Cutter.

Illusion for Window Attraction

Gold fish and canary birds, living together in what seems like one receptacle, make an unusual show window attraction. Secure two glass vessels having straight sides of the same height, one 18 in. in diameter (Fig. 1) and the other 12 in. in diameter (Fig. 2). The smaller is placed within the larger, the bottoms being covered with moss and aquarium decorations which can be purchased at a bird store. Fill the 3-in. space between the vessels with water. Cut a piece of galvanized screen into circular form to cover the larger vessel, and hang a bird swing, A, Fig. 3, in the center. Place the screen on top of the vessels so that the swing will hang in the center of the inner vessel. A weight—a box filled with sand will do—should be placed on top of the screen, over the smaller vessel, to keep it from floating. Moss should be put over the top of the screen so that the two separate vessels can not be seen.

18 in. Diameter
Fig. 1

12 in. Diameter
Fig. 2

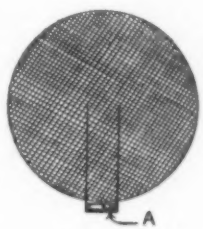


Fig. 3

Fig. 4

Birds and Fish Apparently Together

Place the birds in the inner vessel and the fish in the water. The effect is surprising. To complete the effect and aid the illusion the vessels can be set in a box lined with black velvet, or on a pedestal.—Contributed by J. F. Campbell, Somerville, Mass.

Cleaner for White Shoes

Finely ground whiting mixed with water to the consistency of paste makes a very good coating for white shoes. A brush can be used in applying the mixture which will dry in a few minutes. It is best to mix only as much paste as required for immediate use.—Contributed by L. Szerlip, Brooklyn, N. Y.

¶ Belt laces should never cross on the side next to the pulley as they will cut themselves in two.

An Outdoor Gymnasium

Part I—The Horizontal Bar

Gymnastic apparatus costs money and needs to be housed, because it will not stand the weather. Gymnasiums are not always available for the average boy who likes exercise and who would like to learn the tricks on horizontal and parallel bars, horse and rings, which all young athletes are taught in regular gymnastic courses.

Any small crowd of boys—even two—having a few simple tools, a will to use them and the small amount of money required to buy the necessary

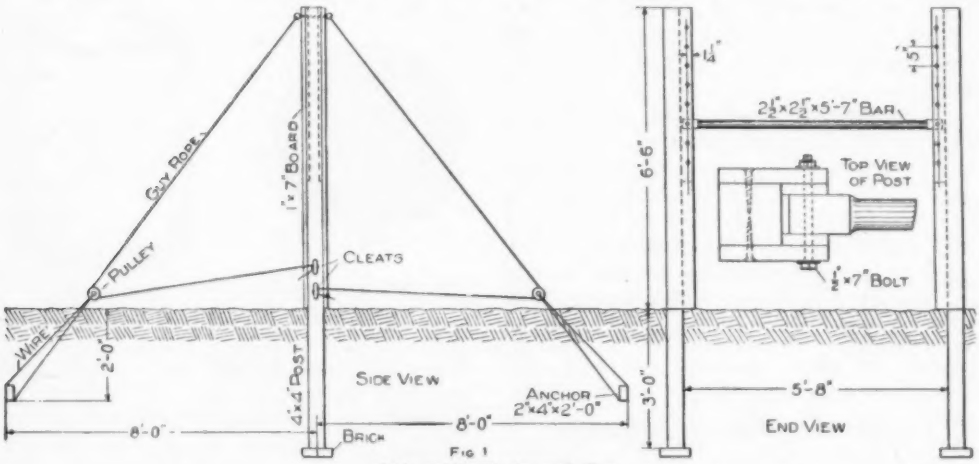


Fig 1

Adjustable Horizontal Bar

wood, bolts and rope, can make a first-class gymnasium. If trees are convenient, and some one can swing an axe, the money outlay will be almost nothing. The following plans are for material purchased from a mill squared and cut to length. To substitute small, straight trees for the squared timbers requires but little changes in the plans.

The most important piece of apparatus in the gymnasium is the horizontal bar. Most gymnasiums have two: one adjustable bar for various exercises and a high bar for gymnastic work. The outdoor gymnasium combines the two. The material required is as follows: 2 pieces of wood, 4 in. square by 9½ ft. long; 4 pieces, 2 by 4 in. by 2 ft. long; 4 pieces, 1 by 7 in. by 6½ ft. long; 4 filler pieces, ¾ by 3 in. by 3 ft. 9 in. long and 1 piece, 2½ in. square by 5 ft. 7 in. long. This latter piece is for the bar and should be of well seasoned, straight-grained hickory. It makes no difference what kind of wood is used for the other pieces, but it is best to use cedar for the heavy pieces that are set in the ground as it will take years for this wood to rot. Ordinary yellow pine will do very well. The four 7-in. boards should be of some hard wood if possible such as oak, hickory, maple, chestnut or ash. The other material necessary consists of 2 bolts, ½ in. in diameter and 7 in. long; 16 screws, 3 in. long; 4 heavy screw eyes with two ½-in. shanks; 50 ft. of heavy galvanized wire: 80 ft. of ¼-in. manila rope and 4 pulley blocks. Four cleats are also required but these can be made of wood at home.

Draw a line on the four 7-in. boards along the side of each from end to end, 1¼ in. from one edge. Beginning at one end of each board make pencil dots on this line 5 in. apart for a distance of 3 ft. 4 in. Bore holes through the boards on these marks with a $\frac{9}{16}$-in. bit. Fasten two of these boards on each post with the 3-in. screws, as shown in the top view of the post Fig. 1, form-

ing a channel of the edges in which the holes were bored. Two of the filler pieces are fastened in each channel as shown, so as to make the space fit the squared end of the bar snugly. The ends of the boards with the holes should be flush with the top of the post. This will make each pair of holes in the 7-in. boards coincide, so the ½-in. bolt can be put through them and the squared end of the bar.

Select a level place where the apparatus is to be placed and dig two holes 6 ft. apart, each 3 ft. deep and remove all loose dirt. The ends of the posts not covered with the boards are set in these holes on bricks or small stones. The channels formed by the boards must be set facing each other with the inner surfaces of the posts parallel and 5 ft. 8 in. apart. The holes around the posts are filled with earth and well tamped.

The hickory piece which is to form the bar should be planed, scraped and sandpapered until it is perfectly smooth and round except for 3 in. at each end. Bore a $\frac{9}{16}$-in. hole through each square end 1¼ in. from the end. The bar may be fastened at any desired height by slipping the ½-in. bolts through the holes bored in both the bar and channel.

Each post must be well braced to keep it rigid while a person is swinging on the bar. Four anchors are placed in the ground at the corners of an imaginary rectangle 9 by 16 ft., in the center of which the posts stand as shown in Fig. 2. Each anchor is made of one 2-ft. piece of wood, around the center of which four strands of the heavy galvanized wire are twisted, then buried to a depth of 2 ft., the extending ends of the wires coming up to the surface at an angle.

The heavy screw eyes are turned into the posts at the top and lengths of ropes tied to each. These ropes or guys pass through the pulley blocks, which are fastened to the projecting ends of the anchor wire, and return to the posts where they are tied to cleats. Do not tighten the guy ropes without the bar in place, as to do so will strain the posts in the ground. Do not change the elevation of the bar without slacking up on the ropes. It takes but little pull on the guy ropes to make them taut, and once tightened the bar will be rigid.

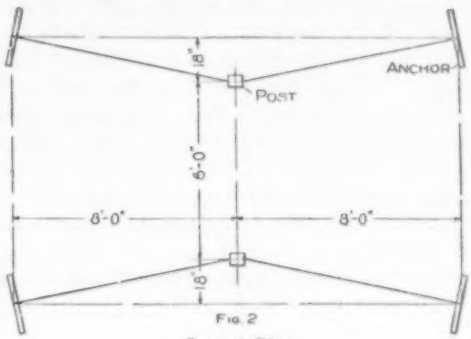


FIG. 2
Ground Plan

Oil the bar when it is finished and remove it during the winter. It is well to oil the wood occasionally during the summer and reverse the bar at times to prevent its becoming curved. The wood parts should be well painted to protect them from the weather.

Electrostatic Illumination

Any one having the use of a static machine can perform the following experiment which gives a striking result. A common tumbler is mounted on a revolving platform and a narrow strip of tinfoil is fastened with shellac varnish to the surface of the glass as follows: Starting beneath the foot of the glass from a point immediately below the stem, it is taken to the edge of the foot; it follows the edge for about 1 in. and then passes in a curve across the base, and ascends the stem; then it passes

around the bowl in a sinuous course to the rim, which it follows for about one-third of its circumference; after which it descends on the inside and terminates at the bottom. The tinfoil on the outside of the glass is divided by cutting with a knife every ⅛ in., the parts inside and beneath the glass being left undivided. Current is then led from a static machine to two terminals, one terminal being connected to one end of the tinfoil strip, and similarly the second terminal makes contact with the other end. As soon as the current is led into the apparatus, a spark is seen at each place where the knife has cut through the tinfoil. If the tumbler is rotated, the effect will be as shown in the illustration. A variety of small and peculiar effects can be obtained by making some of the gaps in the tinfoil larger than others, in which case larger sparks would be produced at these points. The experiment should be carried out in a darkened room, and under these circumstances when nothing is visible, not even the tumbler, the effect is very striking.

How to Make a Wireless Telegraph Set

Part II—The Spark Coil

By Arthur Moore

The spark coil is the principal piece of apparatus used in the transmitter of a wireless telegraph set and its detailed construction is given herewith. The coil described here can be used for ordinary laboratory work, lighting Geissler tubes, etc., in addition to its use in the wireless set. All spark coils might be thought of as composed of the following parts: iron wire core, primary winding, secondary winding, vibrator, condenser, and containing case. These various parts will be taken up in turn.

The core of a spark coil is one of the most important parts and it should be constructed of a large number of small soft iron wires. If a solid iron core is used the reversal of magnetism in the core does not take place as rapidly as the current is interrupted by the vibrator. That is, the solid iron core would not take on and lose its magnetic effect as rapidly as the vibrator worked, which would result in a weak current in the secondary. A core composed of a number of small iron wires is said to be laminated.

To build the core procure a sufficient quantity of No. 22 gauge soft iron wire to form a bundle 1 in. in diameter, and 10 in. long. All of these pieces should be cut to the same length and straightened before they are placed in the bundle. One easy way to form this core is to wind on a stick 1 in. in diameter at least six turns of good quality paper and glue the various turns, as they are rolled on, forming a tube. Fill this tube with the pieces of iron wire, then roll it between two boards which will cause the wires to bed themselves better, and you can add more pieces, making your core much more compact. Wrap this core with a good quality twine, such as is used by shoemakers, the various turns to be placed neatly together.

Outside of the twine wrap 15 or 20 layers of very porous tissue paper and boil the whole core in a hot bath of beeswax and paraffin for at least one hour. This completes the core and you can now wind upon it the primary winding. The primary winding is to consist of three layers of No. 16 gauge double cotton-covered magnet wire wound on the core to within 1 in. of each end. It might be well to place two or three turns of good quality paper between the various layers. A terminal at least 10 in. long should be left at each end for making connections to the coil. It might be well for you to place a piece of small rubber tubing over the terminals where they are led from the winding. The completed core and winding, as shown in Fig. 1, should be thoroughly boiled in bees-

wax and paraffin before starting on the secondary winding.

The secondary winding is to be placed outside of this primary winding but must be insulated from it by an insulating tube placed over the primary winding. You can construct such a tube by winding on a piece of wood, whose outside diameter is a little greater than the outside diameter of the primary winding, several layers of paper and afterwards boiling it in paraffin. This tube should be about 2 in. longer than the primary winding and the inside diameter should be a neat fit over it. The wall should be about $\frac{3}{16}$ in. in thickness. All the additional space between the primary winding and the tube should be filled with paraffin.

Too much care cannot be used in properly constructing and insulating the secondary winding. For very small coils it is customary to wind all of the secondary wire in one section while in larger coils the secondary winding is composed of a number of sections, if it is desired to reduce the possibility of breakdowns. When all of the wire is wound in one section the difference in electrical pressure between the various layers becomes enormous and the insulation must be greatly increased. If the secondary is made of a number of sections, as shown in Fig. 2, and they are so connected that their electromotive forces all act in the same direction, the same total electromotive force can be obtained from the coil, but the voltage between the various parts of the winding is not nearly so great as in the previous case.

The secondary of the coil described here is to consist of six double sections, and these six sections when placed side and side should take up a length of 6 in., that is, each section should be 1 in. in thickness. You will find the winding of these various sections of the secondary a very tedious job if attempted by hand and time will be gained by constructing a simple form of winding machine.

The core of the form upon which these coils are to be wound should have a diameter a little greater than the outside diameter of the insulating tube. The cross section of such a form is shown in Fig. 3. The disks D_1, D_2 and D_3 can be made of ½-in. wood and should be about 4 in. outside diameter. The two cores C_1 and C_2 should have a length of about ½ in. and the diameter of the two ends should differ by $\frac{1}{16}$ to

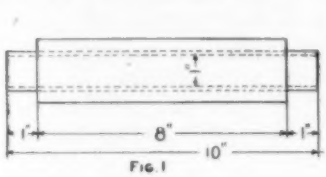


Fig. 1

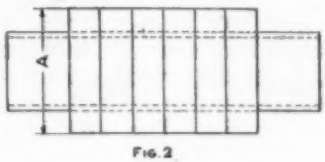


Fig. 2

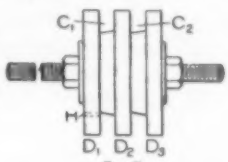


Fig. 3

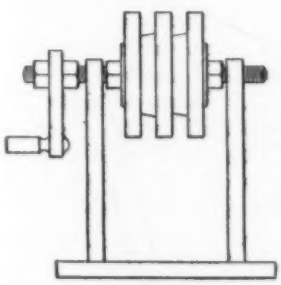


Fig. 4

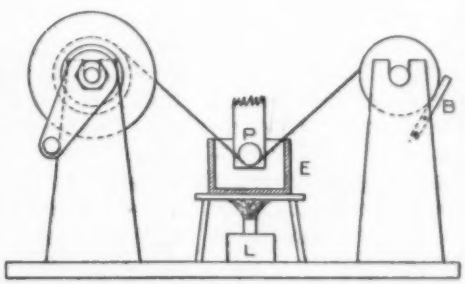


Fig. 5

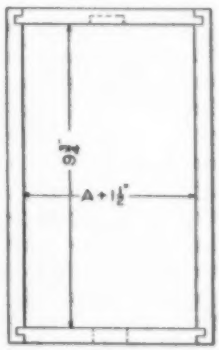


Fig. 6

Method of Winding the Coils

⅛ in. This form can be fastened in a lathe and the wire wound on in a very short time, but usually the amateur has no lathe that can be used and must devise some type of machine that will serve the same purpose. The form just described can be supported by two uprights as shown in Fig. 4 and it can be rotated by means of a small handle attached to one end of the shaft.

In winding the secondary, the wire should pass through a hot bath of beeswax and paraffin as it is being placed on the coil, instead of depending upon the boiling out process as in the case of the primary winding. This can be accomplished by the arrangement shown in Fig. 5. A small can, E, is supported above a gas or oil flame, L, and contains the beeswax and paraffin. The wire is made to pass through this mixture because it must pass over the small pulley P which is below the surface of the mixture. The tension in the wire can be adjusted by placing a small brake, B, on the spool from which the wire is being unwound. There will be needed for each double section about 5½ oz. of No. 34 gauge single silk-covered magnet wire. Make sure in winding that the operation is slow enough to allow the wire to become thoroughly saturated, but it must reach the coil before the wax has had time to cool. You can remove the coils from the form very easily if you line the form with sheets of paper before you start the winding. To wind one of the double sections proceed as follows: Pass 3 or 4 in. of the wire through the opening H in disk D_1, Fig. 3, and wind 2¾ oz. in the regular way upon the core C_1, terminating the winding on the right-hand side of the coil or next to the disk D_2. When this first coil is complete remove the form from the shaft and turn the coil around and place it back on the shaft. The disk D_2 will now be on the left-hand side of the coil and the inside end of the coil winding will project through the disk D_1 on the right-hand side. Carefully remove the disk D_2 and place four or five paper washers that have been saturated in paraffin against the side of the coil. Put the core C_2 in place with its small end to the left and the disk D_3 on the outside. Do not replace disk D_1. Solder the end of the wire to the inside end of the first coil. Tape this point thoroughly and do not use a flux that will destroy the wire. Two and three-fourths ounces of wire should now be wound on the second core and the winding terminated at the right-hand side or near the disk D_3. It no doubt would be best to boil this double section in hot paraffin before it is removed from the form. If this is done do not allow it to get too cool before the disks and cores are removed, as the coil may be damaged in trying to separate them. These various sections may be placed in linseed oil and allowed to soak, which will add to their insulation properties.

When all of the sections are complete they should be placed on the outside of the insulating tube and connected in series in such a way that if a current is passed through them it will flow around the core in the same direction in all of them. Seven or eight paper washers saturated with paraffin should be placed between each double section as they are placed on the insulating tube. This completes the most difficult part of the work and the next thing in order will be the construction of a suitable case for the coil.

The customary manner of constructing such a case is to make the base in such a form that it will contain the condenser, and the primary and secondary windings can be placed in a smaller case mounted upon this base. The binding-posts which serve as terminals for the primary and the vibrator are also mounted upon the top of the base.

Cut from some well-seasoned cherry or other close-grained wood two square pieces whose edge is ½ in. greater than the outside diameter of the completed secondary. Bore a 1-in. hole through the center of one of these pieces and a 1-in. hole half way through the center of the other. Figure 6 gives the dimensions of the sides and the means of fastening the ends and sides together. The bottom can be made of ⅜-in. ma-

terial held in a groove ⅜ in. wide and ¼ in. deep, cut around the inside of the frame just formed ¼ in. from the edge. This bottom must be put in place before the frame is fastened together. The coil will also have to be put in place before the frame is fastened together. The top can be made from ½-in. material and screwed to the top of the frame with round-headed brass screws. The corners can be rounded off and the box given a nice finish.

Wood-Working for Beginners

By Ira S. Griffith

CHAPTER V

Planes: How to Set and Adjust the Irons

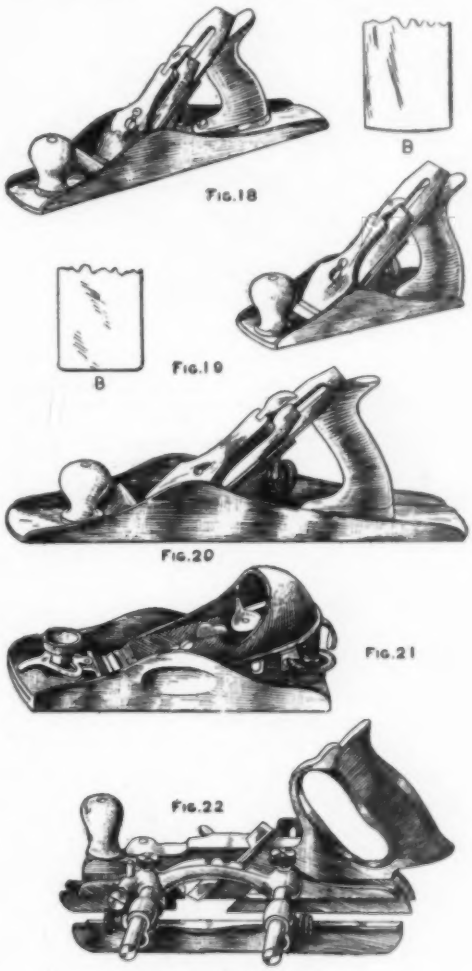
Among the various planes used by wood-workers are the following: block plane, smooth plane, jack plane, jointer and a special plane known as a combination plane. Not all of these planes are absolutely necessary for simple work such as a beginner would do, but they are desirable. The smooth plane, jack plane and jointer differ only in their length, width of cutter or plane iron and in the manner of shaping the cutting edge of the plane iron.

The jack plane, Fig. 18, is used for planing off rough surfaces or where it is desired to take off a large quantity of wood quickly. Since it is not expected to leave the surface smooth, this being done by means of another plane, the plane iron of the jack plane is ground rounding as shown in Fig. 18, B, this form of iron being better adapted for "roughing off."

The smooth plane, Fig. 19, is shorter than the jack plane. Since it is used merely, as its name implies, for smoothing off surfaces that have previously been straightened, or surfaces where straightening is not essential, the short length is an advantage rather than a disadvantage. Its plane iron is ground straight across with the corners very slightly rounded, Fig. 19, B.

For planing long edges straight the jointer, Fig. 20, is used. Because of its great length it makes edge planing much easier than when the shorter planes are used. On account of its length the high places must be cut off before the plane iron can touch the low places. Its iron is sharpened like that of the smooth plane—straight across.

The block plane, Fig. 21, is used for planing the ends of pieces of wood; for this reason no cap iron is necessary to break the shaving, there being none, only sawdust. It also differs from the other planes in that the bevel of the plane iron is turned up instead of down.



Different Kinds of Planes

The block plane's chief advantage over the other planes for end planing lies in its being small enough to be operated

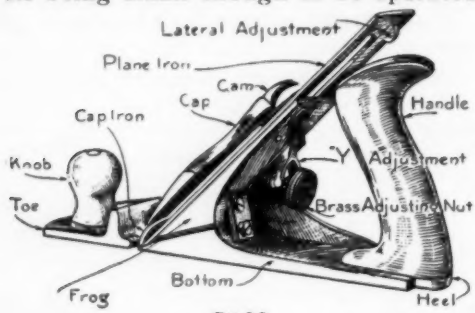


FIG. 23

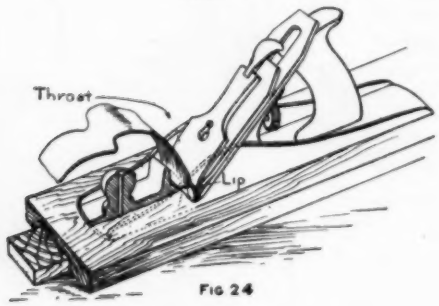


FIG. 24

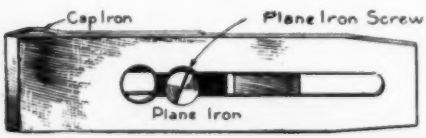


FIG. 25
Plane Parts

with one hand, leaving the other free to hold the board.

The combination plane, Fig. 22, is used in making grooves, rebates, etc. By an exchange of cutters it may be made to take the place of a great variety of special planes.

Figure 23 shows a section of a modern plane and gives the names of the more important parts. From this it will be seen that the principal parts consist of (1) the cap, (2) the cap iron which breaks and bends the shaving (Fig. 24) so that the wood may be torn up, (3) the plane iron for cutting the wood and (4) the frog to which these parts are fastened.

Figure 25 shows the relative positions of plane iron and cap iron. The cutting edge of the plane iron should extend about $\frac{1}{16}$ in. below the edge of the cap iron for ordinary work. For fine work the distance between the edges should be less. The cap iron and plane iron must be firmly fastened together, the cap being used to turn the stout screw unless a screwdriver is at hand, otherwise a few strokes will have pushed the iron back into the mouth of the plane.

After these parts are securely fastened together put them on the frog, plane iron down and cap iron up, making sure the plane iron rests flat on the frog with the Y-adjustment in the slot in the cap iron made for it. Next, place the cap in position and push down the cam. Should this cam work loosely and the plane iron and cap iron not be held firmly, adjust the cap screw. Ordinarily this screw when once adjusted needs no attention. Should the cam work too hard, make sure the plane iron is flat on the frog before releasing the cap screw.

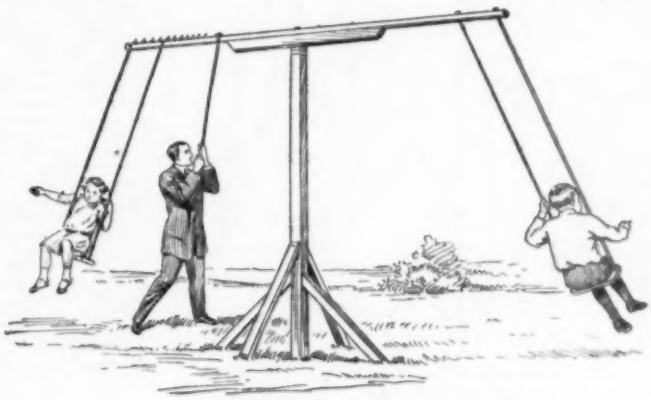
To adjust the blade or plane iron, hold it as shown in Fig. 26, turning the plane toward the light. Sight along the bottom, turning the adjusting nut until the blade will project very slightly, not much more than the thickness of drawing paper. The most common error beginners make in learning to use the plane is setting the plane iron too far out of the mouth of the plane. Move the lateral adjusting lever to one

Fig. 26—Adjusting the Plane Iron

side or the other until the plane iron projects the same amount on each side.

A Merry-Go-Round Thriller

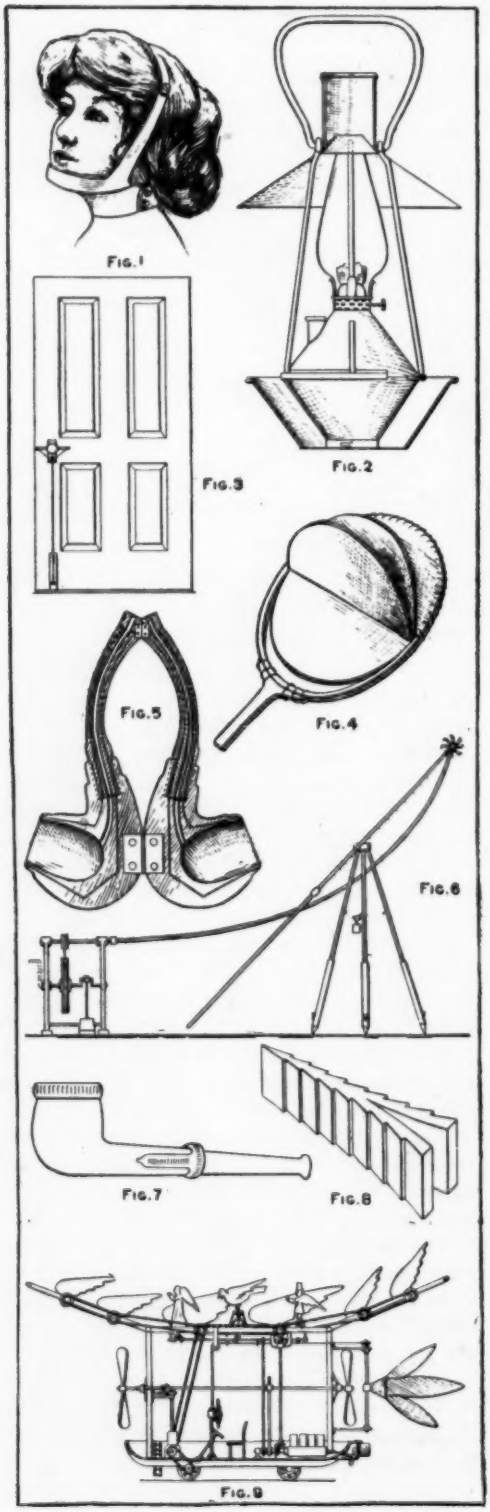
As a home mechanic with a fondness for amusing the children I have seen many descriptions of merry-go-rounds, but never one which required so little material, labor and time, and which gave such satisfactory results, as the one illustrated herewith. It was erected in our back yard one afternoon, the materials being furnished by an accommodating lumber pile, and a little junk, and it has provided unlimited pleasure for "joy-riders," little and big, from all over the neighborhood. It looks like a toy, but once seat yourself in it and begin to go around, and, no matter what your age or size may be, you will have in a minute enough thrill and excitement to last the balance of the day.



Swinging on the Merry-Go-Round

The illustration largely explains itself, but a few dimensions will be a help to anyone wishing to construct the apparatus. The upright is a 4 by 4-in. timber, set 3 ft. in the ground with 8 ft. extending above. It is braced on four sides with pieces 2 in. square and 2 ft. long, butting against short stakes. The upper end of the post is wound with a few rounds of wire or an iron strap to prevent splitting. The crosspiece is 2 in. square, 12 ft. long, strengthened by a piece 4 in. square and 5 ft. long. These two pieces must be securely bolted or spiked together. A malleable iron bolt, ¾ in. in diameter and 15 in. long is the pivot. On this depends the safety of the contrivance, so it must be strong enough, and long enough to keep firmly in the post. Drive this bolt in a ⅜-in. hole bored in the post, which will make it a sufficiently tight fit. Make the hole for the bolt very loose through the crosspiece, so that there will be plenty of "wobble," as this is one of the mirth-making features of the machine. Use a heavy washer at the head. The seats are regular swing boards, supported by a stout and serviceable rope. A ¾-in. rope is not too heavy. One set of ropes are passed through holes at the end of the crosspiece and knotted on top. The other set should be provided with loops at the top and slid over the crosspiece, being held in position by spikes as shown. This makes an easy adjustment. Seat the heavier of the riders on the latter seat, moving it toward the center until a balance with the lighter rider is reached. A rope tied to the crosspiece about 2 ft. from the center, for the "motive power" to grasp, completes the merry-go-round.

Put plenty of soap or grease between the crosspiece and upright. Be sure to have room for the ropes to swing out at high speed, with no trees or buildings in the way. The "wobble" mentioned will give an agreeable undulating motion, which adds greatly to the flying sensation. This will be found surprisingly evident for so small a machine. As there is no bracing, care must be taken to have the two riders sit at the same moment, or the iron bolt will be bent out of line. If it is to be used for adults, strong clear material only should be employed.—Contributed by C. W. Nieman.



INTERESTING PATENTS

CHIN MASK—This rubber chin-mask (Fig. 1) is presumably designed to take its place among the many devices for the preservation and beautifying of the face and head. It fastens over the head and around the neck, and is shaped to hold the lower jaw in proper position and press back any indication of double chin.

INSECT-DESTROYING LAMP—Figure 2 shows a lamp device for the destruction of insects that fly at night. Combined in the device are a base pan, a lamp, a shade and a cylindrical cage loosely disposed upon the shade. The cylindrical cage, which is shown directly above the chimney, has a screen covering its upper end. The insects, attracted by the light, fly under the lamp shade, and are caught in the cage and burned.

HANDLE-CONTROLLED DOOR STOP—The door attachment shown in Fig. 3 will hold a door in any position desired by simply releasing the handle. It consists of a rubber block and a spring, connected with the door handle by means of a wire. The turning of the door-knob elevates the block from the floor, and its release causes the block to again engage with it.

AN AIR-COOLING FAN—The ordinary fan cools the person using it by creating a draft of air, but this fan (Fig. 4) also cools the air. The body of the fan consists of three sheets, the inner one of which is composed of absorbent material. This is moistened with water and the textile sheets are fastened in position over it. The movement of the fan moistens the air, thus cooling it.

SANITARY TOBACCO PIPE—The difficulty of keeping the ordinary pipe clear of nicotine has resulted in the invention of the pipe shown in Fig. 5. In principle, it operates in the same manner as a pipe case, separating through the center and swinging open on hinges at the base of the bowl and near the end of the stem. When open, the bowl and passage leading up through the stem are completely exposed for cleaning. The draft channel is made air-tight by means of a rib on one section, and a groove on the other, in which the rib engages. The two sections are held tightly together by means of a ring on the bowl and on the stem.

ROTARY HEDGE-TRIMMING MACHINE—This apparatus (Fig. 6) is a rotary hedge-trimming machine, the knives of which are driven by a flexible shaft. The knives are stellated cutting blades mounted adjacent to one another, one of the blades being rotated by the flexible shaft. The shaft is driven by means of a hand-turned set of gears mounted on a standard, and the cutting blades are forced against the material to be cut by means of a pole, which is supported by a tripod standard.

MATCH-SCRATCHING ATTACHMENT FOR PIPES—A match-scratching device that may be affixed to the stem part of the bowl of a pipe is shown in Fig. 7. Barbs on the inner side of the scratching surface may be forced into the wood of the pipe to keep it in position. It is made still more secure by means of a clip that encircles the stem and hooks into an eye.

ATTACHING WEDGE—Figure 8 is a flat wedge of resilient material split longitudinally for a portion of its length, from its thick end towards its thin end, thus forming two resilient wings. The exterior faces of the wedge are formed with teeth inclined towards the butt end. A wooden shank, with a metallic socket, fits into the split portion of the wedge for driving it.

AN EXTRAORDINARY FLYING-MACHINE—The purpose to which the inventor expects to put this remarkable flying device (Fig. 9) is beyond conjecture, but that she (the inventor is a woman) has some serious end in view is probable from the fact that it has just been patented. If it were designed for a toy the patent specifications would probably have stated so, yet that is what it seems to be. The specifications say it is a flying-machine, consisting of the combination with a body, of a main and an auxiliary motor supported within the body, propelling means operatively connected to both motors, and movable wings supported above the body and operatively connected to the motors. Among the different propelling devices shown by the drawing are a screw propeller at the stern, arranged like that of a motorboat; two air propellers, one forward and the other at the rear; and a number of wings, a central bird, a figure of an angel, and a man with wings and a top hat.

PRACTICAL OR UNIQUE

ROPE-MAKING MACHINE—Figure 10 is a simple rope-making machine, consisting of three hooks with gearing for rotating them. The three hooks are not all in a direct line, the side hooks being projected in advance of the central hooks to form an accurate series for maintaining the three strands at uniform length.

COLLAPSIBLE STEEL HORSE—The steel horse shown by Fig. 11 has legs that can be folded up against the body out of the way. The construction is of angles and butts with stiff connection between legs and body. It is quite as light as the ordinary wooden horse, and is adapted to any of its uses.

TROUBLE-FINDING SPARK GAP—Ignition trouble is sometimes difficult to locate in an automobile engine because of the number of cylinders, any one of which may be the one making the trouble, but with this extra trouble-finding spark gap (Fig. 12), a 6-cylinder engine is said to become as simple as a single-cylinder engine. It is substituted for the terminal on each spark plug, and the terminal in turn is attached to the end of the trouble-finder. The spark gap, which duplicates the spark occurring within the combustion chamber, is covered with glass so that the operator can see exactly how the ignition is working.

SPRAY ATTACHMENT FOR DENTAL DRILLS—Figure 13 is a spray attachment to be used in combination with a drill in dental work, and its purpose is to keep the surface being drilled, or otherwise worked upon, free of the substance thrown off by the drill. It consists of a nozzle running parallel with the handle of the drill, and a bulb attachment held in the hand as shown by the drawing. The bulb is detachable.

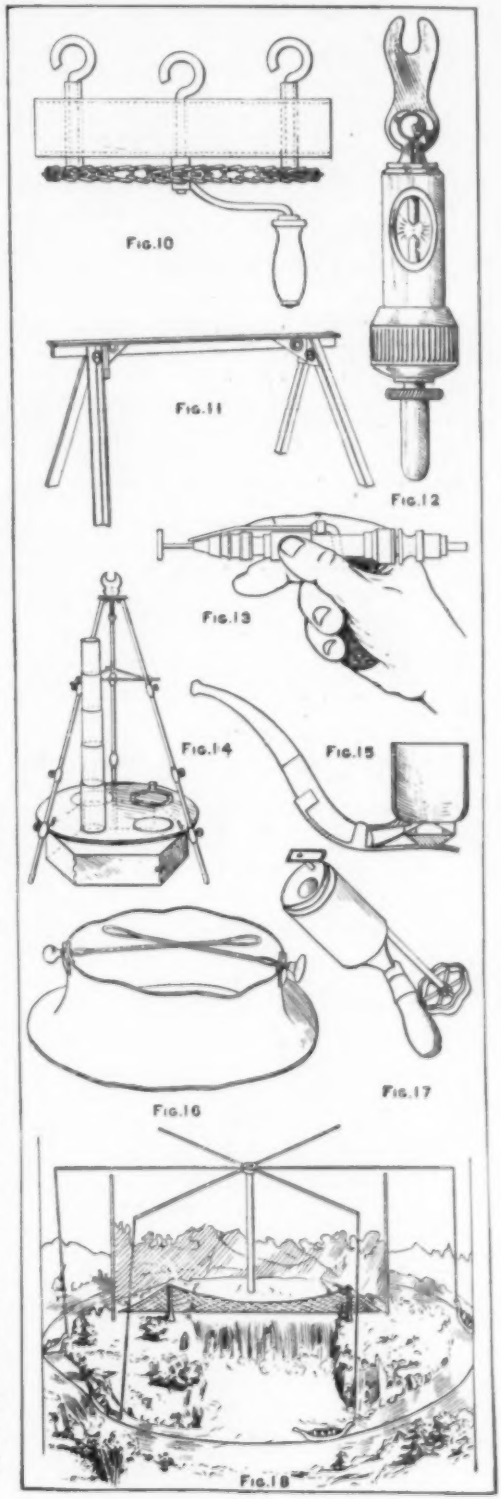
STOVE FOR CAMPS—The inventor of this device (Fig. 14) believes he has designed an ideal stove for camping. It consists of a collapsible metal casing to form the fire-box, a sectional top provided with a stove-pipe hole and three openings, and an adjustable tripod designed to hold the chimney in position and provide a crane for some kinds of cooking. The circular stove top is attached to the lowest joints of the tripod by means of hooks, so that there is a few inches of space intervening between it and the top of the fire-box.

MUSICAL PIPE—This pipe (Fig. 15) may be used either for smoking or for the making of musical notes, but not for both at the same time. The bowl has a contracted opening at the inner end, and a tubular stem secured to the inner end and terminating at one side of the opening, so arranged as to direct a current of air across the opening to produce a sound. The bowl is adapted to form an extension of the vocal cavity of the operator's mouth, whereby musical notes may be produced. In order to adapt the pipe for smoking, a plug pierced by a duct is provided to connect the duct of the stem with the smoking cavity of the bowl.

SAFETY-HATPIN—The hat-pins in this hat (Fig. 16) are of a safety variety just patented. The loops just back of the heads and at the ends of the pins are expanding. To use the pins, the crown of a hat must be provided with slotted plates, through which the pins are passed. The loops close together when pushed through the slots, then expand and lodge tightly in the hair.

CARBON REMOVER—Deposits of carbon on the inner surfaces of gasoline engines are usually removed by pouring kerosene into the chamber, but Fig. 17 shows a scraping device with which to accomplish the same result. It comprises a guide adapted to fit in an opening in the end of the engine cylinder, a stem passing through the guide and turning within it, and a scraper blade carried by the end of the stem. The scraper is moved over the surface to be cleaned of carbon by turning the stem.

AQUATIC MERRY-GO-ROUND—New devices are continually being designed for the amusement of the thousands of people who patronize amusement parks. One of the latest is this aquatic merry-go-round (Fig. 18). It consists of a circular waterway, guiding means for the boats that ride on the waterway, a sheet of falling water incorporated into the scenery inside the waterway, and means for feeding the water producing the falls from the stream on which the boats travel, this water finally emptying back into the stream.



HUG-CHUG!
Br-r-r! b-r-r-r.
Honk-honk!
Gilligillug-gilligillug!
The pedestrian paused at the intersection of two busy cross streets.
He looked about. An automobile was rushing at him from one direction, a motorcycle from another, an auto-truck was coming from behind and a taxi-cab was speedily approaching.
Zip-zip. Zing-glug!
He looked up and saw directly above him a runaway airship in rapid descent.
There was but one chance. He was standing upon a manhole cover. Quickly seizing it, he lifted the lid and jumped into the hole just in time to be run over by a subway train.—Cleveland Plain Dealer.

◆ ◆ ◆

Teacher: "Johnny, can you tell me how iron was first discovered?"
Johnny: "Yes, sir."
"Well, just tell the class what your information is on that point."
"I heard father say yesterday that they smelt it."—Am. Artisan & Hdwe. Record.

◆ ◆ ◆

With stealthy footsteps the burglars made their way into the business office of the merchant whose store they had just entered.
Flashing a dark-lantern around the room, they saw that the door of the safe was partly open.
On a small table near the safe lay several documents.
The burglars inspected them.
One was a bill for automobile repairs.
Another was an ice bill.
Both were receipted.
"Pete," said one of the two men in a hoarse whisper, "ther' hain't no use lookin' at the other dockyments. We're too late!"—International Railway Journal.

◆ ◆ ◆

First plumber (glancing across the street)—"Your neighbor over the way doesn't look like a very active man."
Second plumber—"I should say he isn't active; why, a moving picture of him would be just an ordinary photograph."

◆ ◆ ◆

He was such a superior super, and simulated the emotions of surprise, horror, contempt, and gentle interest so admirably while the "stars" were speaking that in the second production of the season they gave him four words to speak. They were very important words. In the very middle of the crisis in the third act he was to rush on the stage, and cry: "The queen has swooned!" The eventful night, the eventful hour, the eventful minute arrived, and the superior super, primed with and proud of his Lilliputian part, rushed frenziedly on to the stage. "The swoon has queened!" he roared excitedly. A roar of laughter shook the foundations of the theatre. But, with a wonderful effort, the superior super regained himself. "I mean," he shouted, "the sween has cooned!" Again the walls trembled. "Come off, you idiot!" muttered the stage-manager, in a hoarse whisper that could be heard all over the house. But the ambitious super refused to surrender, and, in a rasping voice, he screamed: "The coon has sweened!"

◆ ◆ ◆

Alarmed Motorist (after collision)—"Are you hurt?"
Butcher's Boy—"Where's my kidneys?"—Punch.

◆ ◆ ◆

It was a murky day in August, and the old sea captains were talking of a schooner which had been struck by lightning a few days before, and adding their contributions to nautical fiction, thinly disguised as fact. "How about the 'Emma S.,' Capt. Eli?" asked the privileged listener at last. "Wasn't she struck once?"

"She was sir," and Capt. Eli fixed his gaze on a crack in the ceiling of the old wharf office. "She was indeed off the cape; home'ard bound, she was."
"I'd like to hear the particulars," said the young man, and all the captains moved in their seats and fixed their eyes on the crack which held the gaze of Capt. Eli.
"'Tisn't much to tell, only what might happen to any vessel under similar circumstances," said Capt. Eli. "A bolt struck the deck amidships, and bored a hole right down through the bottom of the schooner big as a man's leg. The water come rushing in, and o' course the Emma S. would have foundered if a second bolt hadn't come and struck my forto 'galla 'mast, cut it off near the top, turned it end for end, and drove it right into the hole, plugging it up and making it water-tight.
"'Twas a clear case o 'what folks call the ravages an' repairs o' nature," said Capt. Eli, as he removed his gaze from the crack and let it rest thoughtfully on the ingenuous face of the only landsman in the company.—Marine Journal.

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A young man took his seat in a restaurant. A waitress approached his table with a shuffling gait.
"Have you frog's legs?" he inquired.
"No, indeed! I have the rheumatiz."

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"A food faddist was lecturing to a large audience on the marvellous results to be obtained from chewing soup, or eating nut butter, or something of that kind. He was not a very imposing person physically, but swelling out his chest, he slapped it thrice, with his palm and cried:
"'Friends, two years ago I was a walking skeleton, a haggard miserable wreck. Now, what do you suppose brought about this great change in me?'
"He paused to let his words sink in, and a voice asked:
"'What change?'"

◆ ◆ ◆

Gilhooley: "You talk about working one's way up in this world—why, look at me, I now have a position where a hundred men work under me."
Willie: "My! You must be delivering the goods. What is your position?"
Gilhooley: "I'm repairing the roof of the back shop, and the other men work on the ground."
—Santa Fe Employes' Magazine.

◆ ◆ ◆

Village Constable (to villager who has been knocked down by passing motorcyclist)—"You didn't see the number, but could you swear to the man?" Villager—"I did; but I don't think 'e 'eard me."—Punch.

◆ ◆ ◆

"Life ain't nothin' but disappointment," groaned the Chronic Grouch.
"Cheer up!" urged the Cheerful Mutt. "Didn't you git $50 for puttin' yer picture in the paper as havin's ben cured o' all yer ills by Bunk's Pills?"
"Yes, I did. An' now all my relatifs are askin' me why I don't go to work, now th't I'm cured!"
—Cleveland Leader.

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After a recent cut-over, when some of the lines were somewhat mixed, a prominent surgeon was called to the telephone to be met with the question, "Is this the butcher shop?" The reply was so hot it blew a fuse.—The Transmitter.

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"Where is Marie?"
"Upstairs, sir. She is arranging madam's hair."
"And madam—is she with her?"—"Rions," Paris.

◆ ◆ ◆

"So you think the automobile has made life much pleasanter?"
"It has for me," answered the comfortable citizen. "I drive a fast horse and my son rides a bicycle. The automobile has taken the minds of the police off both of us."—Washington Star.